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VOLUME VIII JUNE, 1917 NUMBER 6

THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

READING AS REASONING: A STUDY OF MISTAKES IN PARAGRAPH READING

EDWARD L. THORNDIKE

Teachers College, Columbia University

It seems to be a common opinion that reading (understanding the meaning of printed words) is a rather simple compounding of habits. Each word or phrase is supposed, if known to the reader, to call up its sound and meaning and the series of word or phrase meanings is supposed to be, or be easily transmuted into, the total thought. It is perhaps more exact to say that little attention has been paid to the dynamics whereby a series of words whose meanings are known singly produces knowledge of the meaning of a sentence or paragraph.

It will be the aim of this article to show that reading is a very elaborate procedure, involving a weighing of each of many elements in a sentence, their organization in the proper relations one to another, the selection of certain of their connotations and the rejection of others, and the coöperation of many forces to determine final response. In fact we shall find that the act of answering simple questions about a simple paragraph like the one shown below includes all the features characteristic of typical reasonings.

J

Read this and then write the answers to 1, 2, 3, 4, 5, 6, and 7. Read it again as often as you need to.

In Franklin, attendance upon school is required of every child between the ages of seven and fourteen on every day when school is in session unless the child is so ill as to be unable to go to school, or some person in his house is ill with a contagious disease, or the roads are impassable.

1. What is the general topic of the paragraph?

.....

2. On what day would a ten-year-old girl not be expected to attend school?

.....

3. Between what years is attendance upon school compulsory in Franklin?

.....

4. How many causes are stated which make absence excusable?

.....

5. What kind of illness may permit a boy to stay away from school, even though he is not sick himself?

.....

6. What condition in a pupil would justify his non-attendance?

.....

7. At what age may a boy leave school to go to work in Franklin?

.....

Consider first the following responses which were found among those made to Questions 1, 2, 5 and 6 above by two hundred pupils in Grade 6. (All are quoted exactly save that capitals are used at the beginning here regardless of whether the pupils used them.)

	Percents.	Number per thousand
J 1. Unanswered	18	180
Franklin	4½	45
In Franklin	1	10
Franklin attendance	1	10
Franklin School	1½	15
Franklin attending school	1	10
Days of Franklin	½	5
School days of Franklin	½	5
Doings at Franklin	1	10
Pupils in Franklin	½	5
Franklin attends to his school	½	5
It is about a boy going to Franklin	½	5
It was a great inventor	½	5
Because its a great invention	½	5
The attendance of the children	½	5
The attendance in Franklin	½	5
School	7½	75
To tell about school	½	5
About school	4	40
What the school did when the boy was ill	½	5
What the child should take	½	5
If the child is ill	2	20
How old a child should be	½	5
If the child is sick or contagious disease	½	5
Illness	1	10
On diseases	½	5
Very ill	3	30
An excuse	2	20
The roads are impassable	1	10

	Even rods are impossible	½	5
	A few sentences	½	5
	Made of complete sentences	½	5
	A sentence that made sense	½	5
	A group of sentences making sense	½	5
	A group of sentences	3	30
	Subject and predicate	½	5
	Subject	½	5
	The sentence	½	5
	A letter	½	5
	Capital	5½	55
	A capital letter	½	5
	To begin with a capital	2	20
	The first word	½	5
	A general topic	½	5
	Good topic	½	5
	Leave half an inch space	2½	25
	The heading	½	5
	Period	½	5
	An inch and a half	½	5
	An inch and a half capital letter	½	5
	The topic is civics	½	5
	The answer	½	5
J 2.	Unanswered	6	60
	Unless the child is so ill as to be unable to go to school	41	410
	Unless the child is unable to go to school	½	5
	Unless she is ill or the roads are impassable	1	10
	Roads are impassable	1	10
	When his baby or brother have some kind of disease	1	10
	When a parent is ill	½	5
	If her father or mother died	½	5
	On her birthday	6½	65
	On her fourteenth birthday	½	5
	On every day	4	40
	On any day	½	5
	Expected every day	1½	15
	On Monday and for 5 days a week	½	5
	On Monday	1	10
	On Friday	1	10
	When school is in session	1	10
	The beginning of the term	½	5
	Fourteen year	½	5
	Age 11	½	5
	She is allowed to go to school when 6 years	½	5
	A very bad throat	½	5
	When better	½	5
J 5.	Unanswered	2	20
	If mother is ill	5½	55
	Headache, ill	½	5
	A sore neck	½	5
	Headache, toothache or earache	½	5
	When a baby is sick	½	5
	Playing sickness	½	5
	Serious	½	5
	When the roads cannot be used	½	5
	Contagious disease, roads impassable	1½	15
	He cannot pass the hall	½	5
	A note	½	5

J 6.	Unanswered	15	150
	Ill with a contagious disease	5	50
	Seven years old	½	5
	By bringing a note	6	60
	When going with his mother to his cousin	½	5
	Is to go his mother	½	5
	When he is well and strong	½	5
	To have a certificate from a doctor that the disease is all over	½	5
	Somebody else must have a bad disease	½	5
	Torn shoes	½	5
	Neat attendance	½	5
	When he acts as if he is innocent	½	5
	Being good	½	5
	By being early	½	5
	Get up early	½	5
	Come to school	1½	15
	Be at school every day	½	5
	If he lost his lessons	½	5
	Illness lateness or truancy	½	5
	A bad boy	½	5
	By not going to school	½	5
	None	½	5
	Not sick no condition and mother not ill	½	5
	Not very good	½	5
	When you come you get your attendance marked	½	5
	Of being absent	½	5
	His attendance was fair	½	5
	Truant	1	10
	If some one at his house has a contagious disease	6½	65
	When roads	½	5
	If he was excused	½	5
	Not smart	½	5
	If his father or mother died	½	5
	By not staying home or playing hookey	½	5

In general in this and all similar tests of reading, the responses do not fall into a few clearly defined groups—correct, unanswered, error No. 1, error No. 2, and so on. On the contrary they show a variety that threatens to baffle any explanation. We can, however, progress toward an explanation, by using the following facts and principles:

In correct reading (1) each word produces a correct meaning, (2) each such element of meaning is given a correct weight in comparison with the others, and (3) the resulting ideas are examined and validated to make sure that they satisfy the mental set or adjustment or purpose for whose sake the reading was done. Reading may be wrong or inadequate (1) because of wrong connections with the words singly, (2) because of over-potency or under-potency of elements, or (3) because of failure to treat the ideas produced by the reading as provisional, and so to inspect and welcome or reject them as they appear.

Everybody, of course, understands that (1) plays a part but it is not so clearly understood that a word may produce all degrees of erroneous meaning for a given context, from a slight inadequacy to an extreme perversion.

Thus *Franklin* in the paragraph quoted (J) varies from its exact meaning as a local unit through degrees of vagueness to meaning a man's name (as in "Franklin attends to his school" as a response to question 1), or to meaning a particular personage (as in "It was a great inventor" as a response to question 1). Thus *Contagious* in paragraph J permits responses to question 5 (What kind of illness may permit a boy to stay away from school, even though he is not sick himself?) ranging from "Scarlet fever, chicken pox, measles or diphtheria," through "Scarlet fever," "headache," "Serious," "Hay fever," "Pimple," to "Contagious or roads impassable," and "All kinds of disease." Thus *Paragraph* in J 1 when over-potent produces responses ranging from "A group of sentences making sense" through "A group of sentences," and "A few sentences," to "The sentence," "Subject and predicate," "Begin with a capital," "A letter," and "Commas and periods."

In particular, the relational words, such as pronouns, conjunctions and prepositions, have meanings of many degrees of exactitude. They also vary in different individuals in the amount of force they exert. A pupil may know exactly what *though* means, but he may treat a sentence containing it much as he would treat the same sentence with *and* or *or* or *if* in place of the *though*.

The importance of the correct weighting of each element is less appreciated. It is very great, a very large percentage of the mistakes made being due to the over-potency of certain elements or the under-potency of others.

Consider first the over-potency of elements in the questions. The first question about paragraph J was, "What is the general topic of the paragraph?" A large group of answers show over-potency of *paragraph*. Such are those quoted above to show variation in the understanding of the word. We also find an over-potency of *top* (in topic) combined with that of paragraph, resulting in such responses as: "Leave a half-inch space," "An inch and a half," "An inch and a half capital letter," "The topic of paragraph is one inch in."

The second question was: "On what day would a ten-year-old girl not be expected to attend school?" We find under-potency of *not* resulting in answers like "When school is in session" or "Five days a week." We find under-potency of *day* resulting in responses like "She is allowed to go to school when 6 years," "Age 11," and "Fourteen years."

We find over-potency of *day* shown by "Monday," "Wednesday," and "Friday"; of *ten-year-old girl* in "The ten-year-old girl will be 5 a."

Ten-year-old is over-potent in an interesting way, namely, in the very large number of responses of "On her birthday." Over-potency of *Attend school* seems to be one part of the causation of "To attendance with Franklin," "Ever morning at half past 8," "She should," and "Because he did learn."

Consider next over- and under-potency of the words or phrases in the paragraph. The following list of responses shows that each of ten words taken from the paragraph is over-potent so as to appear clearly influential in the response to each of the first three questions (and in seven of the cases to the fourth question as well). These occur within five hundred responses made by children within grades 5 to 8. Cases of under-potency would be still easier to collect.

The questions, I may remind the reader, were as follows:

1. What is the general topic of the paragraph?
2. On what day would a ten-year-old girl not be expected to attend school?
3. Between what years is attendance upon school compulsory in Frankln?
4. How many causes are stated which make absence excusable?

(The numbers refer to the question to which the words were the response.)

Franklin	1. Franklin. 1. Franklin and the diseases. 1. Franklin topic. 2. Franklin. 3. Because it is a small city. 3. Franklin was in school 141 years.
attendance	1. Attendance. 2. To attendance with Franklin. 3. In Franklin attendance upon school is required. Attending school 130 days.
school	1. School. 1. They must know their lessons. 2. In the beginning of school. 3. School in session. 3. In the years of school.
seven	1. Seven and fourteen. 1. How old a child should be. 2. He should attend school at 7 years. 2. Between seven and fourteen. 3. Seven years. 4. Under seven.
fourteen	1. Every child between seven and fourteen. In Franklin how old they are. 2. Fourteenth of every day. 2. Fourteen years. 3. Fourteen years. 3. Fourteen. 4. 7 to 14.

every	1. Every child. 2. Expected every day. 2. On every day. 3. Every year. 3. Every child between fourteen or thirteen. 4. Every day.
ill	1. Illness. 1. Very ill. 1. If the child is ill. 2. Ill. 2. A very bad throat. 3. He cannot go to school unless ill. 4. When child is ill. 4. Must be sick.
contagious	1. Contagious disease. 2. If she is sick or has a contagious disease. 3. Contagious disease. 4. Contagious disease.
disease	1. Fever. 1. About disease. 2. Often sick. 3. Unless ill or contagious disease. 3. Disease. 4. A terrible disease going out. 4. Because when a boy has disease.
impassable	1. The roads are impassable. 1. Snow. 2. When roads are impassable. 3. Seven to foirteen years or the roads are impassable. 4. Or the roads are impassable.

To make a long story short, inspection of the mistakes shows that the potency of any word or word group in a question may be far above or far below its proper amount in relation to the rest of the question. The same holds for any word or word group in the paragraph. Understanding a paragraph implies keeping these respective weights in proper proportion from the start or varying their proportions until they together evoke a response which satisfies the purpose of the reading.

Understanding a paragraph is like solving a problem in mathematics. It consists in selecting the right elements of the situation and putting them together in the right relations, and also with the right amount of weight or influence or force for each. The mind is assailed as it were by every word in the paragraph. It must select, repress, soften, emphasize, correlate and organize, all under the influence of the right mental set or purpose or demand.

Consider the complexity of the task in even a very simple case such as answering question 6 on paragraph D, in the case of children of grades 6, 7 and 8 who well understand the question itself.

John had two brothers who were both tall. Their names were Will and Fred. John's sister, who was short, was named Mary. John liked Fred better than either of the others. All of these children except Will had red hair. He had brown hair.

6. Who had red hair?

The mind has to suppress a strong tendency for *Will had red hair* to act irrespective of the *except* which precedes it. It has to suppress a tendency for *all these children . . . had red*

hair to act irrespective of the *except Will.* It has to suppress weaker tendencies for *John, Fred, Mary, John and Fred, Mary and Fred, Mary and Will, Mary Fred and Will,* and every other combination that could be a "*Who,*" to act irrespective of the satisfying of the requirement "had red hair according to the paragraph." It has to suppress tendencies for John and Will or brown and red to exchange places in memory, for irrelevant ideas like *nobody* or *brothers* or *children* to arise. That it has to suppress them is shown by the failures to do so which occur. The *Will had red hair* in fact causes one-fifth of children in grades 6, 7 and 8 to answer wrongly,* and about two-fifths of children in grades 3, 4 and 5. Insufficient potency of *except Will** makes about one child in twenty in grades 6, 7 and 8 answer wrongly with "all the children," "all," or "Will Fred Mary and John."

Reading may be wrong or inadequate because of failure to treat the responses made as provisional and to inspect, welcome and reject them as they appear. Many of the very pupils who gave wrong responses to the questions would respond correctly if confronted with them in the following form:

Is this foolish or is it not?
The day when a girl should *not* go to school is the day when school is in session.
The day when a girl should not go to school is the beginning of the term.
The day etc. . . . is Monday.
The day is fourteen years.
The day is age eleven.
The day is a very bad throat.
Impassable roads are a kind of illness.
He cannot pass the ball is a kind of illness.

They do not, however, of their own accord test their responses by thinking out their subtler or more remote implications. Even very gross violations against common sense are occasionally passed, such as letting Mary give Tom a blue dog, or giving "Thought the man fat out" as an answer to I 1. Usually, however, the irrelevance or inconsistency concerns something in the question or the paragraph and the failure to heed it is closely akin to the under-potency of certain elements.

I.

Nearly fifteen thousand of the city's workers joined in the parade on September seventh, and passed before tho hundred thousand cheering spectators. There were workers of both sexes in the parade, though the men far out-numbered the women.

1. What is said about the number of persons who marched in the parade?

---

* Some of these errors are due to essential ignorance of "except," though that should not be common in pupils of grade 6 or higher.

It thus appears that reading an explanatory or argumentative paragraph in his text-books on geography or history or civics, and (though to a less degree) reading a narrative or description, involves the same sort of organization and analytic action of ideas as occur in thinking of supposedly higher sorts. This view is supported by the high correlations between such reading and verbal completion tests, Binet-Simon tests, analogies tests and the like. These correlations, when corrected for attenuation, are probably, for children of the same age, as high as +.80.

It appears likely, therefore, that many children fail in certain features of these subjects not because they have understood and remembered the facts and principles but have been unable to organize and use them; or because they have understood them but have been unable to remember them; but because they never understood them.

It appears likely also that a pupil may read fluently and feel that the series of words are arousing appropriate thoughts without really understanding the paragraph. Many of the children who made notable mistakes would probably have said that they understood the paragraph and, upon reading the questions on it, would have said that they understood them. In such cases the reader finds satisfying solutions of those problems which he does raise and so feels mentally adequate; but he raises only a few of the problems which should be raised and makes only a few of the judgments which he should make. Thus one may read paragraph I with something like the following actual judgments:

Fifteen thousand did something—there was a parade—September seventh was the day—there were two hundred thousand something—there was cheering—workers were in the parade—both sexes in the parade—the men outnumbered the women.

Contrast these with the following which may be in the mind of the expert reader:

Nearly fifteen thousand—not quite, but nearly—of the city's workers—people who worked for a living—joined in the parade—a big parade of nearly 15,000—on September seventh—the parade was in the fall—they passed before two thousand hundred cheering spectators—two hundred thousand saw the parade—they cheered it—there were workers of both sexes—there were men workers and women workers in the parade—the men far outnumbered the women. Many more men than women were in the parade.

In educational theory, then, we should not consider the reading of a text-book or reference as a mechanical, passive, undiscriminating task, on a totally different level from the task of evaluating or using what is read. While the work of judging and applying doubtless demands a more elaborate and inventive organization and control of mental connections, the demands of mere reading are also for the active selection which is typical of thought. It is not a small or unworthy task to learn "what the book says."

In school practice it appears likely that exercises in silent reading to find the answers to given questions, or to give a summary of the matter read, or to list the questions which it answers, should in large measure replace oral reading. The vice of the poor reader is to say the words to himself without actively making judgments concerning what they reveal. Reading aloud or listening to one reading aloud may leave this vice unaltered or even encouraged. Perhaps it is in their outside reading of stories and in their study of geography, history, and the like, that many school children really learn to read.

PRELIMINARY INVESTIGATION OF SKIMMING IN READING[1]

GUY M. WHIPPLE AND JOSEPHINE N. CURTIS

SUMMARY

This appears to be the first published experimental study of the process of skimming in reading. Six subjects, university students and instructors, read selected prose passages in different ways: silently at normal rate, silently at maximal rate, aloud at normal rate, aloud at maximal rate and by skimming (sometimes at their own rate, sometimes at a prescribed rate). The speed of reading was recorded by a stop-watch and in most experiments the efficiency of the reading was tested by demanding a reproduction, orally or in writing, of the passage read. Each subject also reported, especially after the skimming tests, how the skimming or reading was done and in what ways the skimming differed from the other modes of reading.

The chief conclusions are:

(1) There appear, even in this small group of college-trained persons, decided individual differences in speed and in efficiency of reading by all the methods, including skimming. One subject, for instance, skims three times as fast as another.

(2) The time per word, in hundredths of a second, is approximately this: normal aloud, 35; maximal aloud, 29; normal silent, 26; maximal silent, 22; skimming, 14.

(3) Knowledge that reproduction is to be demanded slows the rate of reading of all subjects by all methods.

(4) Speed of skimming increases in the later portions of texts several pages in length.

(5) The slowest reader is also the poorest reproducer.

(6) The best reproducer is a fast, though not the fastest, reproducer.

(7) The devices adopted in skimming are so different in different readers as to preclude summarizing.

(8) Skimming, itself, embraces at least five different varieties, or modes.

(9) When readers are forced to skim at a prescribed and unusually high rate, reproduction becomes very poor and the whole process becomes disagreeable and flurried.

---

[1] This investigation was carried on at the Educational Laboratory of Cornell University, from February to May, 1914. The general arrangement and supervision of the work was in the hands of Professor Whipple, now of the University of Illinois; the actual experimentation was in the hands of Dr. Curtis, now Assistant Psychologist at the Psychopathic Hospital, Boston. Acknowledgment is due to Mr. W. K. Layton, Assistant in Education, University of Illinois, for valued help in preparing the results for publication.

(10) Preferred rate in skimming is fairly closely correlated with natural rate in ordinary reading—the coefficient of correlation between normal silent and skimming speeds is +0.71.

(11) Subject matter lying outside the reader's general range of information would undoubtedly be skimmed only with difficulty and poorly, since in successful skimming much is supplied by the reader's previous information or his interpretation of the writer's intent as gathered from the context.

(12) It seems probable that practice in skimming might profitably be given in the public school.

Introduction

Although attention has been paid to the rate of reading and queries have been raised as to the possibility of developing more rapid rates in school children or of gaining speed by eliminating audition and getting meaning directly through vision, and although here and there there has been occasional mention of the shifts that occur in mental processes with very rapid reading, yet, so far as the writers know, this account is the first experimental study dealing primarily and directly with the subject of skimming.

The following citations are illustrative, though not exhaustive, of the literature to which we refer:

"Doubtless many of us dawdle along in our reading at a plodding pace which was set and hardened in days of listless poring over uninteresting tasks or in imitation of the slow reading aloud which was so usually going on either with ourselves or with others in the school." (Huey, *Psychology and Pedagogy of Reading*, pp. 179ff.)

"One of the great advantages of the shorter lines [as in newspapers] is that they constantly permit the reader to see in indirect vision what his eye has just passed as well as what is coming . . . a most desirable condition for all reading and especially for fast reading or for skimming." (Huey, *Op. cit.*, p. 411.)

"Any arrangement which makes comprehensive skimming an easy matter will be of great benefit for large parts of our reading." (Huey, *Op. cit.*, p. 423.)

In all these exercises [brief blackboard exposures of words to be acted out by children] the endeavor is to train the child to omit the auditory image, to develop speed in reading and to read for thought." (Klapper, *Teaching Children to Read*, p. 26.)

"The good reader takes all reading to be his province. Newspapers, periodicals, books, old and new, all present themselves to him in their proper perspective; they are all grist to his mill, but they do not go into the same hopper or require the same process. . . . Milton may be read in words or lines, Macaulay in sentences, Thackeray in paragraphs, and Conan Doyle in pages. . . . Skimming and rapid reading are different processes, but skimming is at times a good thing, too; even skipping becomes, on occasion, a sacred duty. . . . For skimming implies cream and skipping, a foothold somewhere." The clever reader finally learns to use his eye like a sixth sense, selecting the gist of the matter in whatever form it may appear. (Anonymous writer in the *Atlantic Monthly*, July, 1902.

"The principles laid down in this most suggestive article [the foregoing one in the *Atlantic Monthly*] are, however they appeal to common sense, relatively unrecognized in the teaching of reading. Teachers, when they thought at all of the importance of reading with different paces, have, it seems, either feared to meddle with anything so dangerous and novel or else they have thought that experience would bring ability to each reader. Unfortunately, it does not always do so, and many a man has wasted days and days in conscientiously going through a process that could have been variously modified with great profit to himself. . . . Training in place of reading and in silent reading are open fields that invite every earnest teacher who would make a real contribution to his pupils as well as to education in general." (Briggs and Coffman, *Reading in Public Schools*, p. 14.)

"When one reads a selection for the sake of the information it contains, he may want all the facts, or only the most important facts, or the argument or the trend of the thought; he may want certain facts or he may want simply to determine whether certain facts are there or not. Each of these distinct purposes requires that the selection be read in a way adapted to the end sought . . . No doubt many teachers, accustomed to insist on literal thoroughness, will see in such half-way reading and 'skimming' as is here advised the sure road to most careless and slovenly habits, which, even with all their 'thoroughness,' they are unable wholly to correct." (Spaulding, *Preventing and Correcting Defective Reading.*)

"A habit of slow reading may be fixed which retards the development of the normal speed. . . . *Some reading exercises should be given with a time limit,* but individual differences of ability should not be overlooked, and *hurried* reading should be avoided." (*The Teaching of Reading,* State of New Jersey, Department of Public Instruction, July, 1914, p. 14.)

Titchener says that his rate of reading varies considerably, both with the subject matter and with the purpose in reading. He would take a new book or article at a rush and then later go over it minutely and slowly if he wished the details. The headlong first reading is visual and diffusely organic in character; the reader pays little regard to headings or italics, taking in the first few words of a sentence and then jumping to catch-words, sometimes omitting entire sentences and even paragraphs. The organic reaction he believes to be widespread and strongly affective; he notes also a play of facial expression. The idea is emphasized that sight and "attitudinal feel" do the skimming, with occasional assistance from internal speech. (*Experimental Psychology of the Thought Processes.*

These citations indicate that, while several writers have urged the desirability of increasing the rate of reading for certain situations and while a few writers have even given thought to devices of instruction or of typography that would facilitate skimming, yet those who have direct charge of developing the reading habits of children are inclined to look doubtfully upon the idea of direct training in skimming.

These citations suggest the desirability of studying the process of skimming more carefully. Of course, not every one that reads does, or can skim, but we may surmise that in persons who read a great deal there is a tendency to skim, at least with certain kinds of material, and we may further surmise that this manner of reading may be further developed by training; possibly, indeed, it might be desirable to give regular practice in skimming to children in the upper grades of the schools after they have sufficiently mastered the mechanics of ordinary careful word-by-word reading.

Such were the considerations that led to our study. It was not found possible to narrow the field of investigation to the extent we might have wished, since, as our citations show, there was no precedent for choice of method or material; consequently, we had to grope our way along and our results can claim to be no more than tentative outcomes of a pioneering survey.

The Observers

The observers were *B*, Mr. Boring, an instructor in experimental psychology who was accustomed to skimming; *Fr*, Mr. Frazer, an assistant in educational psychology, who did not skim but read very fast, finding this more economical than to do the selecting necessary in skimming; *Gst*, Mr. Goldstone, an undergraduate who read very rapidly but did not skim and who had a slight speech defect (a lisp and a tendency to stutter); *Sk*, Mr. Skinner, a graduate working in psychology and educational psychology who read slowly and did not skim except when looking for some particular thing on a page; *D*, Miss Dimmick, an undergraduate who had done considerable work in psychology and educational psychology and who read very fast without skimming; and *Gou*, Miss Goudge, a graduate working in psychology and educational psychology, who said that the nature of the subject matter determined her method of reading.

Method of Experiments

Five kinds of reading were used: (1) reading silently at what the observer considered his normal rate; (2) reading silently at maximal rate; (3) reading aloud at normal rate; (4) reading aloud at maximal rate, and (5) skimming. The observer held the material in his own hands and started skimming or reading at a signal, saying "Finished," or "Done," when the assignment was completed. He was told beforehand how many pages there were in each article, that he would be required to reproduce, either orally or in writing, as much of the article as possible, and that after the reproduction he would be asked to give a detailed description of how he skimmed or read, especially as to differences between skimming and reading. By the use of a split-second stop-watch the time spent on each page and on the whole article was accurately recorded. The material used varied from one set of experiments to another, sometimes typewritten sheets, sometimes books on educational topics.

Preliminary Experiments

Preliminary experiments were performed both to ascertain what method and what material would probably be best for the main experiments and also to give the observers some practice. Typewritten sheets were used as the material; these were of equal length, and did not vary as to type, spacing, margins, paragraph-

ing, etc., but only in subject matter and style. Since the sheets contained almost exactly the same number of words, the rate of reading is recorded in the average number of seconds required to read the pages, and not—as in the later tables—in the average time spent on each word. The observers who took part in these preliminary experiments were *D*, *Fr*, *Gou*, *Gst*, and *Sk*.

TABLE I.

Average Time Taken for Reading Typewritten Sheets at the Various Rates

Observer	Silent				Aloud			
	Normal		Maximal		Normal		Maximal	
	Time	Rank	Time	Rank	Time	Rank	Time	Rank
D.....	72.5	2	68.3	4	81.9	1	77.2	3
Fr.....	78.5	3	50.3	2	86.0	3	64.0	1
Gou.....	89.6	4	74.0	5	84.6	2	75.0	2
Gst.....	51.9	1	47.6	1	91.4	4	84.4	4
Sk.....	93.5	5	67.3	3	92.1	5	85.6	5

TABLE 2

Percent of Typewritten Sheets Reproduced

Observer	Silent				Aloud			
	Normal		Maximal		Normal		Maximal	
	Percent.	Rank	Percent.	Rank	Percent.	Rank	Percent.	Rank
D...	36.73	3	29.70	2	27.52	5	24.17	3
Fr...	57.61	1	39.18	1	66.41	1	31.73	2
Gou.	42.28	2	21.85	3	29.81	3	23.26	4
Gst..	34.50	4	17.40	4	41.32	2	34.01	1
Sk...	18.00	5	15.35	5	27.98	4	17.86	5

From the tabulated results of the preliminary experiments (Tables 1 and 2), we find that *Gst* is a very rapid silent reader. He reports no kinaesthetic imagery at all and very little auditory imagery, so it is quite probable that he is a visual reader. *Fr* is evidently the best reproducer, and *Sk* the poorest. The others show considerable variation. In comparing Tables 1 and 2 we find that the slowest reader is the poorest reproducer, and that the best reproducer is above the average in speed of reading. Table 3 records the results secured when the material was read with the definite knowledge that it would not have to be reproduced. The significance of these figures, while not apparent here, will be evident later.

TABLE 3

Decrease in Time Required to Read a Sheet (on the Average) When Reproduction was Not Required

Observer	Silent		Aloud	
	Normal	Maximal	Normal	Maximal
D.....	10.7 (14.76%)	14.0 (20.50%)	2.2 (2.69%)	1.1 (1.43%)
Fr.....	19.1 (24.33%)	8.1 (16.10%)	7.6 (8.84%)	7.5 (11.72%)
Gou.....	31.0 (34.60%)	26.1 (35.27%)	5.3 (6.26%)	15.4 (20.50%)
Gst.....	00.4 (0.77%)	04.7 (9.87%)	11.0 (12.04%)	7.9 (9.36%)
Sk.....	30.7 (32.83%)	3.5 (5.20%)	2.0 (2.2 %)	5.1 (5.96%)

In the second part of the preliminary experiments the typewritten sheets were abandoned because of the relative illegibility of the print, the evident advantage in skimming of having the material divided properly into paragraphs, and the difficulty of providing enough sheets for the entire experiment. Selections from the *Bulletins* of the United States Bureau of Education were used instead. In any one bulletin three selections were read: one normal silent, one maximal aloud, and the third skimmed in roughly one-half or one-third the time which the observer would probably have taken to read the selection at normal silent speed. Reproductions were taken as before. The results of this work will be found in Tables 4 and 5.

TABLE 4

Average Time per Word and Average Per Cent. of Material Reproduced from the Bulletins

(Figures are enclosed in parentheses when the number of cases is too small to ensure accurate results.)

	Normal Silent		Maximal Aloud		Skimming (½ Normal)		Skimming (⅓ Normal)	
	Time	Percent.	Time	Percent.	Time	Percent.	Time	Percent
D.....	.27	80	.25	63	.11	28	.08	35
Fr....	.22	88	.20	90	.11	45	.08	60
Gou...	.24	58	.22	50	(11)	10	.08	30
Gst...	.12	(53)	.24	(42)	.06	5	.04	30
Sk....	.33	57	.28	53	.15	25	.10	30

TABLE 5

Observers Arranged in Order of Speed of Reading and of Excellence of Reproduction from the Bulletins

Normal Silent		Maximal Aloud		Skimming (½ Normal)		Skimming (⅓ Normal)	
Time	Percent.	Time	Percent.	Time	Percent.	Time	Percent.
Gst	Fr	Fr	Fr	Gst	Fr	Gst	Fr
Fr	D	Gou	D	D	D	Fr	D
Gou	Gou	Gst	Sk	Fr	S	Gou	Gst
D	Sk	Gst	Gou	(Gou	Gou	D	Gou
Sk	Gst	Sk	(Gst)	Sk	Gst	Sk	Sk

From these tables we may conclude that *Fr* is the best reproducer, *D* the next best, and that *Sk* is the lowest reader. Here the results for *Fr* and *Sk* agree with those obtained from the earlier experiments.

The chief features of the reports about what happened in skimming are as follows: *D* reported that she read the topic sentence[2] carefully and then followed down the sides of the paragraph, catching an important word occasionally and then following the sentence until the verb was reached. *Fr* attempted to

[2] The observers in these experiments meant by the "topic sentence,"—the one which contained the gist of the paragraph,—most often the first sentence in the paragraph.

force the pace by reading vertically, but found it could not be done, and finally hit upon the method of noting necessary "beads," *i. e.*, important words, which occur at fairly regular distances apart (?); he says skimming is successful and easy if one can fit one's jumps of attention to this distance between important words. *Gou* read the topic sentences, and then, keeping these in mind, skimmed down the center of the page for new ideas of importance. She usually read some or all of the concluding sentences of paragraphs. *Gst* skipped from topic to topic, keeping the leading ones in mind, omitting the middle portions of sentences, and emphasizing nouns. *Sk* took note of the main words, that is, the more general ones, supplying the others. These reports will be generalized later, when the results of the main experiments are discussed.

Main Experiments

In the main experiments Mangold's *Child Problems* was used as the material for reading; since its subject matter was about equally familiar to all the observers, its text is divided into sections of approximately equal length, and it was long enough to afford a good deal of material. The observers in this part of the investigation were *B*, *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The method used was the same as in the previous work, except that after three selections (about two pages each) had been skimmed at a rate chosen by the subject, one selection was read at some other speed, as, for example, maximal silent. In all, twelve selections were skimmed. The results from these experiments are recorded in Tables 6, 7, and 8.

From the arithmetical results we may draw the following conclusions:

(1) The twelve passages appear to have been about equal in difficulty, since no one of them is found to stand uniformly high or low in the speed with which it was skimmed by the six readers (Table 6.)

(2) The speed of reading under these conditions is such that on the average 5.9 words are *covered* (not read, of course) per second, or one word each 0.169 sec. (Table 7.)

(3) Under instructions to skim there remain marked individual differences in the rate; thus, to cite extremes, *Gst* skims at nearly three times the pace of *Gou*; again, we note that *Fr* can read

TABLE 6

Twelve Passages Arranged in Order of Speed for Each Reader

B	D	Fr	Gou	Gst	Sk
7	10	4	6	4	5
8	3	5	3	2	1
4	7	7	1	6	4
12	8	10	5	1	8
6	9	1	8	5	11
10	1	9	9	9	7
2	11	12	4	10	10
11	12	2	7	12	9
9	2	6	12	7	12
3	4	11	10	11	6
5	6	3	11	3	2
1	5	8	2	8	3

TABLE 7

Average Time per Word in Skimming 12 Passages (in Sec.)

Reader	12 1st pages	12 2d pages	8 3d pages	General Aver.
B.....	.211	.154	.135	.171
D.....	.176	.150	.166	.164
Fr.....	.155	.157	.164	.158
Gou.....	.247	.233	.194	.228
Gst.....	.107	.097	.085	.097
Sk.....	.257	.210	.177	.199
Aver....	.192	.167	.153	.169

TABLE 8

Average Per Cent. of Reproduction for Each Selection Skimmed

	1	2	3	4	5	6	7	8	9	10	11	12	Av.
B.....	50	50	50	60	60	60	80	75	75	50	50	50	59
D.....	70	60	50	50	60	60	60	50	80	30	30	40	53
Fr.....	60	80	70	80	85	70	75	80	85	85	80	80	78
Gou.....	85	90	75	75	60	75	70	60	70	40	60	80	70
Gst.....	75	60	70	60	50	50	70	60	50	60	30	60	58
Sk.....	80	60	25	60	40	60	70	40	60	20	50	30	50

aloud (Table 4) faster than *Gou* skims silently in these passages (Table 7). In fact, it appears htat *Gou* really does not succeed in achieving any noticeable increase of speed when directed to skim (her rate per word in normal silent reading is 0.24 sec. per word; in maximal speed aloud, 0.22 sec.; in skimming 0.228 sec.)

(4) By comparing the speed of skimming by pages, we find that it runs approximately 0.19 sec. per word for the first page, 0.17 sec. per word for the second page and 0.15 sec. per word in the third page (of the 8 passages that ran over two pages in length).[3] The explanationis presumably in part general "warming up" to mental work, in part increase of ease of "skipping" in the later portions of the selections as the context "piled up" and supplied more and more material for guiding the reader.

[3] The data from which these figures are derived are not shown in detail in any of our tables.

The following conclusions may be drawn from the statements of the observers as to their methods of skimming:

(1) All the observers, with the possible exception of *Fr*, read the greater part of the *first sentence*, "to get the 'run' of the thing."

(2) After this, skipping began, and now greater *individual variations* were found. *B* usually stopped in sentences after reading about half, or enough to determine whether the thought had been changed, and jumped practically all quotations. *D* read the first sentence, and then passed down the page, selecting words that seemed important, hesitating long enough to get their meaning in the sentence. She pronounced to herself only the important words. *Fr* read vertically, finding that two words usually gave the meaning of a line, took fairly large jumps, and noted a tendency to stop and read "slogans" and "catch-words." *Gou* believed that her eye movement was faster than in ordinary reading. She skipped usually just after getting a new and important point, moving the eye vertically at these times, trying to select anything important enough to be read, in part or entire. *Gst* skipped no entire sentences, but in reading the last thought of a sentence attempted to catch the opening phrase of the next, and then omitted it if it was not the thought wanted. He filled in a great deal from previous experience. *Sk* read "mostly the high places," attempting to read the outline of the selection and infer the remainder. Frequently, after glancing at the first few words of a phrase or sentence, he could judge whether or not to go on. In jumping from a sentence to several below, he found no particular criterion by which to determine where to begin again, sometimes starting in at a new paragraph and again at some particular word or phrase that he happened to see. In general, he read the first sentence of a selection and then enough of the succeeding sentences to find out whether or not they were essential or were merely elaborations or "filling-in" of the previous thought. If they were essential, enough was read to give the thought, and if not, a jump was made to the next sentence or phrase, and it received similar treatment.

(3) The observers differed in their treatment of the *last sentences* of a paragraph; *D* always read them, *Gst* never unless forced; the others sometimes read them and sometimes did not.

(4) The observers differed also in the discrimination used in *rejecting certain parts of the material.* *B* reported that he skipped

sentences referring to particular instances of laws, that is, those containing names of states, phrases whose sense was markedly supplementary, and quotations. He regarded quotations as "padding." *D* skipped sentences beginning with small words, or where there seemed to be no important words. *Fr* tried to skip minor details, but reported that he was really "too conscientious to be a good skimmer" and feared lest he might omit something important. *Gou*, after a new "important point," moved down the page until she found another important point. *Gst* skipped what seemed to be "filling-in" and details that were known. *Sk* skipped parts "not essential to the gist"—whenever he thought he could reason or infer the meaning without reading. Evidently, *B* used more logical discrimination in his skipping than did the other observers.

(5) The influence of *punctuation* was mentioned by *B*, *D*, and *Fr*; *B* reported that it was taken "on the jump," not exactly the mere marks, but the general spacing of the sentence. He found that the exclamation mark had tremendous attention-compelling power. *D* thought punctuation gave hints as to the importance of the material; she had a tendency to read material set off by quotation marks. *Fr* found the attraction of capitals and quotation marks so strong that he jumped directly to them. *Gst* said that punctuation marks did not exist for him, but he gave preference to short sentences, so probably he was affected by the spacing, at least. *Sk* mentioned capitals and italics. In general, there seemed to be a rather definite tendency for all observers to attend to proper nouns, italics,[4] and quotation marks.

(6) There was a considerable amount of individual variation as to the *kinds of material* easy to skim, and difficult to skim. *B* could skim easily what was well-paragraphed, *D* what was tabulated, *Fr* if the "pitch"[5] was fairly wide and successfully estimated near the beginning; *Gst* found it hard to skim what was interesting, while *Sk* found this easy.

From the preliminary experiments it was evident that condensed material is very hard—almost impossible—to skim; and that when the material is divided into paragraphs, it is easier to skim than if it is all in one paragraph. From the results of

[4] Our observers differ from Titchener evidently in this and other respects.

[5] "Pitch" apparently meant the amount of the skip or jump to be made, the distance from one essential idea to the next one.

some of the auxiliary work, it was evident that skimming was easier in material in which the first sentence of each paragraph was the topic sentence.

(7) There was a *tendency to glance back* at catch-phrases, italicized words, etc., or perhaps merely at the form or length of the paragraphs, to summarize the impressions gained. Doubtless the knowledge that a reproduction of the passage was to be demanded prompted this hasty retrospective glance. This tendency was shown particularly by *B*, *D*, *Gou*, and *Gst*.

(8) Certain notes made by the experimenter show differences in the forms of the reproductions. Thus *B* gave a logical paraphrase; *Fr* gave details and all in proper order; *Gou* gave her reproduction slowly but with evidence of the "logical schemas" which she was accustomed to make during the skimming; *Gst* often reproduced first the material which he had read last. *Fr* is a lip-reader and sometimes whispers the words.

(9) There are apparently different modes of rapid reading and skimming: (a) fast reading, in which every word is read, usually in kinaesthetic or auditory-kinaesthetic terms; (b) "trailing," which is "perceiving without apperceiving," catching impressions which may or may not be meaningful for the context—probably not in most cases; (c) "covering," like trailing, except that it may be either up and down or right and left, while trailing is the latter; (d) *omitting logically*, the procedure used when the first few words of a sentence are read and the observer decides it is unimportant and omits the rest; (e) *omitting arbitrarily*, as *Fr* did. (This observer, when starting a new selection, arbitrarily chose a size of "jump" which he thought fitted the material, and then took jumps of this size throughout, reading only those words which happened to come at the end of a jump.) Of the methods mentioned, *B* used (b) and (d), *D* (b) or (c), and (d), *Fr* (e), *Gou* (b)?, (c)?, (d), *Gst* (b) and (d), and *Sk* (b) and (d).

Auxiliary Experiment 1

(Extra Fast Skimming)

From the results of the main experiments it was evident that the observers differed greatly in the speed of skimming (see Tables 4 and 7), and it therefore seemed advisable to discover, if possible, what would be the *effect of diminishing the time* allowed for the skimming, by forcing each observer to skim faster than he would naturally.

The observers who took part in this work were *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The material was four educational reprints which contained, respectively, 3476, 1764, 1650, and 3360 words. Three minutes were allowed for skimming the first (the observer was warned at the expiration of each quarter of the time); one minute for the second; one minute for the third, and one minute and a half for the fourth. The rate of skimming was .05 per word for the first, .03 for the second, .04 for the third, and .03 for the fourth reprint.[6]

The following conclusions may be drawn from this experiment:

(1) Reproduction falls off when the observer is forced to read at these high speeds. *Gou* and *Fr* tried to get only the main points and skip the rest, while the other observers tried to trail over the whole thing and lost everything.

(2) In general, the first sentence of a paragraph is more likely to be read than the rest; italics are likely to be read, and fine print, such as that used for foot-notes, is almost sure to be omitted.

(3) The main points in the reports of the observers are as follows: *D* failed to get connected ideas, took larger jumps and read largely by italicized words and phrases rather than sentences —"did not like skimming so fast"; *Fr* read italics and quotations and guessed at the content of the paragraphs (a few supplementary experiments revealing that *Fr*, when instructed to skim as fast as possible, seemed to give up his system of arbitrary jumps and skim as the others did); *Gou* could not work out logical schemas as she did before, and could reproduce only the first sentence of paragraphs; *Gst* notices slight emotional disturbances, and found it hard to keep the logical sequence of ideas, and was able to reproduce practically nothing from the fastest passages; *Sk* got no sense out of the articles and noted only the first sentences of paragraphs or those which stood out because of quotation or question marks.

Auxiliary Experiment 2

(Long Passages)

An additional experiment was carried out to see what would be the *effect of length of passage* on the rate of skimming. For this were used six educational reprints, varying in length from 2805

[6] These rates may be compared with those for normal silent reading (roughly .20 to .30) and for the previous skimming (roughly .08 to .17).

to 6624 words. All observers except *B* took part. The method was the same as that used on the main experiments. The results given in Table 9 show that the rate of skimming quickened with the lengthening of the article to be skimmed. It should be noted, however, that this increase in speed may be almost entirely

TABLE 9

Average Speed of Skimming, in Sec. per Word, for Articles of Varying Length

(Articles A and B contained 3000 words, C 4000; D and E 5000; and F 6600, approximately.)

	A	B	C	D	E	F
D	.10	.16	.09	.09	.11	.05
Fr	.07	.08	.07	.05	.08	.07
Gou	.12	.17	.10	.12	.18	.14
Gst	.06	.09	.06	.05	.07	.05
Sk	.08	.20	.11	.06	.07	.06
Av.	.12		.09	.09		.07

brought about by the observer's decision that he has already "taken in" all he can hold for the coming reproduction and that he will attempt to read nothing but the most important points on the later pages. *D*, losing interest toward the end of the passages, skipped a great deal there and felt that, in general, she skimmed in the same manner as in the shorter passages; *Fr* took longer steps; *Gou* thought she skipped more in skimming a long than a short article; *Gst*, when told in advance that the article was long, tended to hurry his skimming; *Sk* read less carefully in the longer selections and omitted much more of the material.

Auxiliary Experiment 3

(Rates of Reading)

A last set of tests was carried out to determine more precisely than the conditions in the other experiments had permitted, the relations between the rates of reading by the five different methods. Here the material used was educational reprints.[7] The observers were *D*, *Fr*, *Gou*, *Gst*, and *Sk*. The method was as follows: each reprint was divided in halves; the first half was then read by one of the five methods, the time recorded, etc.; then the second half was read by another of the methods. In

[7] The following may be cited as examples of reprints used in this work: Kirkpatrick, "Child Study," *Pop. Sci. Mo.*, 1910; Ayres, "Psychological Tests in Vocational Guidance," this JOURNAL, 1913; Bagley, "Elective Studies in the High-School Curriculum," *Sch. Rev.*, 1908; Bingham, "The Use of Experiment in Teaching Educational Psychology," this JOURNAL, 1910.

all, 8 passages were read by each method; the same passage was never re-read. This general arrangement was designed to cancel out the effects of possible unevenness of the material.

TABLE 10

Average Time, in Seconds per Word, for Selections Read by the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	Time	Rank	Time	Rank	Time	Rank	Time	Rank	Time	Rank
D	.28	3	.25	3.5	.33	3	.27	2.5	.15	4
Fr	.19	2	.16	2	.27	1	.24	1	.12	2
Gou	.32	4	.25	3.5	.40	4	.28	4	.17	5
Gst	.13	1	.11	1	.32	2	.27	2.5	.08	1
Sk	.37	5	.32	5	.43	5	.37	5	.14	3
Av	.26		.22		.35		.29		.13	

TABLE 11

Average Reproduction (on Scale of 100) for the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
D	76	3.5	72	3	75	3	76	4	73	3.5
Fr	89	1	89	1	98	1	85	1	81	2
Gou	84	2	84	2	81	2	83	3	86	1
Gst	76	3.5	71	4	74	4	84	2	73	3.5
Sk	65	5	60	5	51	5	58	5	50	5
Av	78		75		74		73		73	

Tables 10 to 12 show the results obtained. From them the following conclusions may be drawn:

(1) *Gst* is the fastest and *Fr* the next fastest silent reader; the same two observers are the fastest in reading aloud, both at normal and at maximal rates. *Sk* is slowest in all these modes of reading. As in the earlier tests *Gou* speeds up less in skimming than do the others.

(2) *Correlations for the speed of reading by the five methods* (calculated by the Pearson method) are as follows:

	r	P.E.
Normal silent and maximal silent	.70	.16
Normal silent and normal aloud	.66	.17
Normal silent and maximal aloud	.42	.25
Normal silent and skimming	.71	.16
Maximal silent and normal aloud	.63	.19
Maximal silent and maximal aloud	.65	.18
Maximal silent and skimming	.61	.19
Normal aloud and maximal aloud	.62	.19
Normal aloud and skimming	.41	.25
Maximal aloud and skimming	.28	.28

We find that there is greatest correlation between skimming-rate and rate for normal silent reading. Only the correlations which are several times the probable error should be considered significant.

(3) From the average time for all the observers we find that *the order of speed for the five methods* is: skimming, maximal silent, normal silent, maximal aloud, normal aloud. The only exceptions to this are *Gou* and *Sk*, both of whom average faster at maximal aloud than at normal silent. If we take the time for normal aloud, the slowest speed, as 100, then maximal aloud would be 83, normal silent 74, maximal silent 60, and skimming 40. If we take normal silent as 100, then normal aloud would be 135, maximal aloud 112, maximal silent 81, and skimming 54.

(4) *Fr* and *Gou* are the best reproducers, and *Sk* the poorest. In comparing (1) and (4) we find that one of the fastest readers is one of the best reproducers, and that the slowest reader is the poorest reproducer, which is what we should have expected in consideration of the results obtained by Abell (*Educational Review*, 8, 1894: 283), Dearborn (*Psychology of Reading*), Huey (*Psychology and Pedagogy of Reading*), and Quantz (*Problems in the Psychology of Reading*). There are, however, two exceptions to this general rule, *Gou* and *Gst*, for *Gou* is one of the best reproducers and one of the slowest readers, while *Gst* is a very fast reader and not a particularly good reproducer.[8]

(5) From the average reproduction, we find that the *reproduction* is likely to be better for normal silent than for any other speeds. (Exceptions: *Gou* best for skimming; *Gst* best for maximal aloud.)

(6) From the mean variations (Table 12) there is least *variation* in the speed of normal aloud, and most for skimming.

(7) The mean variations for the different observers show that in general, *Fr* and *Gst* were most, and *D* and *Gou* least variable.

(8) From inspection of the average time taken to read the various selections and of the mean variations for each speed, we may conclude that the *material was fairly uniform in eifficulty*.

[8] There seems to be an explanation of this paradox. It will be remembered that *Gou* proved to be greatly affected in speed by the necessity of reproducing at the end. It therefore seems probable that, either voluntarily or involuntarily, she slowed down her speed in order to make a better reproduction at the end, while the other observers did not do this. If *Gou* had worked under exactly the same conditions as the others, there might have been a change in her position as a reproducer, in which case the position of *Gst* would have been moved up and the results would have been more nearly what we should have expected.

TABLE 12

Per Cent. Mean Variation for the Various Observers in Time per Word for the Five Methods

	Silent				Aloud					
	Normal		Maximal		Normal		Maximal		Skimming	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
D.....	14.29	4	8.00	5	6.06	5	11.11	2.5	20.00	2
Fr.....	21.05	1	12.50	2.5	14.07	1	12.50	1	16.67	3
Gou.....	18.75	2	12.00	4	10.00	3	7.14	5	11.76	5
Gst.....	15.38	3	18.18	1	12.50	2	11.11	2.5	12.50	4
Sk.....	13.51	5	12.50	2.5	6.98	4	10.81	4	22.22	1
Av.....	13.60		12.64		9.92		10.53		16.63	

Conclusion

The principal factual conclusions of our experimentation have already been presented in the summary that precedes the article. It remains only to remind the reader that our study has been limited to a small group of adult readers, all college-trained and all somewhat familiar with the subject matter read. However, without risking generalization we can at least say that ~~our study~~ has indicated methods that may be employed and probably fore-shadowed some of the general outcomes that may be expected in a more comprehensive survey of the problem. We would suggest that a fruitful extension of the present investigation would be the application of similar methods to a group of children of perhaps different pedagogical and different mental levels, with special reference to the effect of practice and to the limitations placed upon skimming by degree of general intelligence and range of information, or special familiarity with the subject matter employed.

In the absence of evidence to the contrary we are disposed to think that systematic drill in skimming is desirable for children that have mastered the mechanics of reading and that are using reading regularly as a tool for the acquisition of knowledge.

THE INFLUENCE OF SPEED DRILLS UPON THE RATE AND THE EFFECTIVENESS OF SILENT READING

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Lehigh University

Within recent years the psychology of reading has been intensively studied by a considerable number of investigators, among whom the following persons have made valuable contributions to the subject: Erdmann and Dodge at Halle in 1908, Dodge at Wesleyan in 1900, Dearborn at Columbia in 1906,[1] Whipple at Cornell, Briggs at Columbia,[1] Pintner,[2] and especially Huey (1907) in his important work on the Psychology of Reading, and Laing (1909) in "The Teaching of Reading." Since that time a number of experiments have been made on silent as compared with oral reading, the most important of which were the Kansas Silent Reading Tests. One of the products of this study has been the discovery that persons differ very widely in the rate at which they read, the difference being frequently three or four to one, and in extreme cases even more. (But the most surprising fact discovered is that rapid reading need not be superficial reading.) Indeed all investigators agree that the rapid readers are, as a rule, the most effective readers. Thus Briggs of Columbia had two persons read Silas Marner, one of whom was able to read 156 pages in an hour and the other only 16. But when ten test questions were given to both on the content of the work read the rapid reader was able to answer them all intelligently while the slow reader could not answer a single one. Klapper quotes from Quantz as follows: "A comparison between the ten most rapid readers and the ten slowest readers shows that the rapid readers remember more of the original thoughts, and that the character of their reproduction is much higher, both generally and with reference to expression and logical content. In the auditory tests the ratio of slow to rapid readers is 14.8 per cent. to 20.7 per cent. in the number of thoughts. In quality the percentages are 48.7 per cent. for slow readers, 60.3 per cent. for fast. The same comparison in the visual tests results as follows: Percentage of thoughts reproduced by slow readers, 14.9; by rapid, 24.4. Quality: slow, 48 per cent.; rapid, 73.3

[1] See Education, 1912 and 1913, for these articles.

[2] PINTNER, *Oral and Silent Reading*, Journal of Ed. Psy., 4: 333.

per cent. The difference in favor of the rapid readers is consequently much greater than in auditory tests, indicating again that rapid readers are, as a rule, of the visual type."[3]

In view of this manifest advantage from rapidity in reading a number of these psychologists urge that, in our teaching, we strive to cultivate it. Our present methods of teaching reading, Professor Whipple thinks, are of such a character as to develop plodding habits of reading, and in consequence sluggish habits of thinking. Professor Klapper also thinks that we must get away from our "Fetish of Oral Reading" and work definitely for "(1) speed, (2) accuracy, and (3) direct association between printed symbol and idea."[4] Laing remarks that "All writers agree that through practice the span of attention (an important element in rapidity in reading) may be increased," Briggs urges the seeking of speed, and Dearborn says, "What may be called speed tests ought on this account to have some place in school methods of teaching reading, as well as in other subjects in which alertness of attention is demanded and cultivated."

But that this ability to read more rapidly could be cultivated had never been demonstrated.[5] There was some reason to believe that it is a native characteristic rather than one due to training. It was certain that rapidity and mental alertness went together but which was cause and which effect had not been ascertained.[6] All of the experiments performed by the psychologists were of a static rather than a dynamic character. They took their subjects at a single stage and compared them with others taken also at a single stage. Moreover the experiments were nearly all performed upon adults, only one or two having to do with children as young as nine years old.[7] To assume from these static experiments that the recommended speed drills would, under ordinary school conditions, be a factor in developing rapidity and attendant effectiveness was a purely

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[3] *Teaching Children to Read*, page 23.

[4] *Teaching Children to Read*, page 23.

[5] Professor Freeman quotes an unpublished thesis by K. D. Waldo in defense of this supposition. But Professor Freeman's tables are not sufficiently complete to indicate whether or not precautions were taken by Waldo to distinguish the result of speed drills from that due to such development as is to be expected through a school year. (*Psy. of Common Branches*, page 90.)

[6] On one side of this question see Freeman, "Psy. of Common Branches," pp. 89–90; on the opposite side see Irving King, "A Comparison of Slow and Rapid Readers," School and Society, Nov. 25, 1916, pp. 830–34.

[7] Recent experiments have, of course, dealt with school children.

a priori inference, so far as I could learn. No trace could be found of any experiment to determine it. It was to empirically test the actual effect of such effort that the following experiment was planned.

In undertaking the experiment the writer hesitated between two methods of working for speed. Should it be by simple speed drills or should there be an effort to control the fixation points? The Psychology of Reading seemed to favor the latter. It was known that rapid readers differ from slow ones very largely in the number of pauses, or fixations of attention and eye direction, which they make in each line. The slow readers make many and irregular fixations; the rapid readers, few and rhythmic ones. It appeared desirable, therefore, to control the place and the number of fixations per line on the part of the reader. The feasibility of determining these points by some sort of marks, or by sweeps of a pointer, or by appropriate spacing, was considered. In addition to their fewness and regularity thus secured the shortening of the period of these fixations, by some device, to the minimum necessary for comprehension was considered. That these fixations should be as short as possible is indicated by the discovery of Cattell, Quantz and others, that when reading matter is exposed for one one-hundredth of a second more of it can be read than when exposed for a somewhat longer time.

But it was also known that interest in the matter read, and an interest in proceeding as rapidly as possible, will alone drag on the fixation points to a greater distance and make their period shorter. Besides it was not established that there is any one optimum length of interval, the evidence indicating that this interval differs for even the same individual according to the subject matter read. It seemed plausible, therefore, that the eye movements would fall of themselves into their best type of rhythm for the particular individual and for the particular subject matter read if no attempt were made to control them from without. Besides it was feared that such devices as would be necessary to control the fixation points would distract attention so much, particularly at first, as to seriously interfere with reading by the young children who were to be experimented upon. It was therefore decided to make no effort to control fixation points by mechanical devices but to rely upon interest in the matter read and, especially, upon the request to get the matter

read as quickly as possible, together with such atmosphere about the room as would encourage speed without producing such undue excitement as would lead to superficial reading. It would, however, be worth while to try this same experiment with the added effort to specifically control the number and the nature of the fixation points.

The Experiment

Our experiment thus narrowed itself down to the specific one of ascertaining the influence upon speed and effectiveness of silent reading from daily speed drills, with oral reproduction, conducted through a period of seven months.

The experiment was carried on in the public schools of Royersford, Pa., during the academic year 1914–15. The writer was at that time supervising principal there. The experiment was made in grades three to six inclusive, though the results of the third grade are not included in the summary of results, for reasons to be discussed later. They are tabulated separately. There were used in the experiment six different teachers and two hundred and seven different pupils. The grades indicated above were chosen because reading receives in them a considerable amount of attention, and because the children here have reached the point in their training where such proportionately great changes in individuality as those of their earlier school years are not to be expected. It was originally the intention to include also grades one and two, but the extreme instability which we discovered in these grades made it advisable to drop them. Our experiment made it necessary to divide these grades into two groups each, as nearly equal as possible. But we soon discovered that, however nearly equal they were in the beginning of the year, forces altogether outside of the experiment might carry them far apart before the year had worn on long when they are so unstable in character as first and second grade pupils necessarily are.

Of the grades that remained there was a teacher for each—third, fourth, fifth and sixth—in one building, and a teacher for the third and fourth together and a second teacher for the fifth and sixth together in another building. Those that had a teacher to each grade were ideally ordered for an experiment. In each of these the pupils were divided into two groups, as nearly equal in numbers and ability as convenient. Then a test, such as those described below, was given in each room, with all essential

conditions carefully kept uniform. Papers were then graded in the manner indicated below, and the group which showed the least speed chosen, when feasible, as the one to receive the drill. Exactly the same test was given, at the same time and with the same attendant conditions, in the two rooms in the other building. In these rooms, however, the pupils of each grade were kept as a single group. Thus for each grade there were three groups, two of which were given the speed drills and one of which was not. The effect of the drill was thus sought by comparing the two groups in each grade which had the drill with the one group which did not.

Method of Conducting Drill

The groups which were not to have the speed drills, and which were to be used as a basis for comparison with those which did have, were dealt with after the usual fashion in teaching reading. The other groups, in addition to their oral reading, were given daily speed drills, without, however, giving a total of any more time to their reading than the other group received. So far as feasible both groups were taught reading at about the same time of day, or else at equally desirable periods. They used the same books and the same degree of enthusiasm was expected to be put into both. The drills were, of course, conducted by the teacher in charge of the class, and ran from November 7th to June 2nd. They were on relatively easy reading matter, and mostly interesting narrative. They occupied ordinarily from five to ten minutes of the reading period. The group as a whole was told explicitly where to begin and how far to read, and were then all set to silent reading at the same time with the exhortation to see who could get it read first. After all, or nearly all, had finished someone was asked to tell the substance of what he had read. If, in this reproduction, he omitted anything he was questioned on it as a guarantee against skimming.

The Tests

Tests were given to both groups on November 6th, January 20th, April 20th, and June 2nd. It was originally intended to give a test at intervals of two school months but when we came, on this basis, to the third test nearly half of our pupils were out with mumps and it was necessary to hold it over about

two weeks until most of the students were back. However, as nearly all of the pupils were out the three weeks quarantine period sometime during the second interval, the amount of practice received in it was approximately the same as in the first interval. However, it cut the length of the last interval to six weeks. These tests were conducted by the teachers in charge of the classes. As the teachers had given the drill, and as the tests were of somewhat the same character, it was thought that their conduct of them would be less of a disturbing factor. Besides, the necessity for conducting them all on the same day and at approximately the same hour made it impossible for the experimenter himself to hold them.

In each case the test consisted of two parts, given on successive days. The first of these parts consisted in the reading of a selection of from eighty to three hundred words with written reproduction of the substance of what had been read; the second, of the reading of directions to perform some act and then the carrying out, on the part of the reader, of those directions. For these tests children were taken in groups of six, so as to permit of an exact record of the time required for each individual to complete the reading. Books were kept closed, or papers turned upside down, while the teacher explained carefully what was to be done and taught any new or difficult words that might appear in the selection, without, however, indicating that they were to appear in this reading. When everything was ready all in the group of six were set to reading at the same time and as they finished they so indicated by raising their hands, closing their books or turning over their papers, and permitting the teacher to record the time. Every effort was made to keep all conditions constant during these tests.

The reading selections used in the tests were in every case narrative in form and somewhat easier than the usual reading for the grade in question. This was done to secure maximum interest, to make reproduction relatively easy, and to permit of the certain employment of any speed for which the pupil might have developed the ability. Different selections were used for the different grades. Stories which we believed the children had never read before were used in every test except the last, when lack of suitable material made it necessary to use matter, in one or two of the grades, which they had read not

less than a year before. Where possible a selection that was complete within the length of a page, or a page and a half, was sought, though we were sometimes obliged to use only parts of stories. We looked for material that was interesting but not so much so as to produce a disturbing amount of emotional strain. Normal print was sought and paragraphs which had their lines broken on account of pictures on the page were avoided.

In the second type of test the task set was in each case the drawing of some object for which directions were given. Here the procedure was the same as indicated above, except that the matter was the same in all the grades, except in the first test when it was somewhat simplified for the lower grades. Care was taken to set for drawing some object which was familiar to every child taking the tests—no easy thing to do, as the experimenter soon discovered. Something was also sought that represented a considerable degree of internal unity, so as to make the execution of the directions reasonably easy, but yet not so much of a unity as to make it possible to draw it without having read all the way through the directions. The directions were extended, by a little padding, to such length as would make it convenient to measure the time without making it so hard to read or carry in mind as to interfere with its purpose. To further facilitate memory a brief review of directions was usually given at the end and invariably the selection closed with some catch sentence, without which the drawing could not be complete, and which would therefore serve as a guarantee that it had been read all the way through. These selections were typewritten, double spaced, and with lines of about seven words in length, such length appearing to about balance the matter as compared to print in books. Care was taken to make all copies alike in all mechanical respects. Three copies were made at a time

DIRECTIONS

No. 1

Draw a square on your paper. A square is a figure with four straight lines as sides. These lines are all of the same length and the four corners are all alike. This ceiling would be a square if it were just as wide as it is long. After you have made the square place a dot right in the middle of it. Be careful to place the dot exactly in the middle. Then draw lines from this dot to each of the corners. That will take four lines. Be sure to make all the lines straight. Remember you are first to draw a square, then place a dot in the middle of it, and then draw lines from this dot to each of the four corners. When you have done this count all the lines and write the number of them on your paper.

No. 2

Draw a house. Make your house two stories high. In the front of the house, on the first story, put a door in the middle and a window on each side. In the upper story put three windows. One of these should be above the door and the others above the windows of the first story. You will find out that this will make your house look best.

Put a fence in front of the house with a gate in it. Mark the path which leads from this gate up to the front door. Remember you are to draw a house, make it two stories high, put a door and two windows below and three windows above, put a fence with a gate in front of it, and mark the path which leads from the gate to the door.

No. 3

Draw a boy's face. Just make a round ring for the head. Not every boy has a round face but a ring will do for this boy. Then put in lines for the nose, the mouth, the two eyes, and the two ears. Also mark his hair. Put some sort of a hat on him. But do not put any body to him. Remember you are to make only a round ring for a head, put in eyes, nose, mouth, ears, and hair, put on a hat, but put no body to the head. Write the boy's name under the face.

No. 4

Draw a bridge across a river. We will suppose that no big boats go up and down this river, so we can put as many posts as we please between the ends of our bridge for it to rest upon. Then, you know, a good bridge must have an iron fence along each side to keep people from falling off. Our bridge must have such a fence. Many people, too, cross a bridge, and ours would not look well unless it showed some of them. But you need not try to draw in their faces. Just a straight stroke would do for each man. Put four such men on the bridge in your picture.

No. 5

Draw a tree as you would see it in winter. You know there are no leaves on the trees in the winter. The leaves grow out in the Spring and drop off in the Fall. Draw five limbs on each side of the trunk of your tree. Make the lower limbs longer than those at the top, as this will make your tree look better. Now, you know, birds often sit on trees. Of course, in winter most birds have gone away, but a few stay here. So mark on your tree three small birds where you think they would sit.

and the same number of carbon copies given to each group. Samples of these directions accompany this paper.[8]

Marking the Papers

The teachers graded the papers. In the reading selections the experimenter indicated the number of thoughts which the selection seemed to contain, and this was made the basis for assigning a percentage to each pupil. The papers were marked for quality of reproduction as well as quantity (in separate grades) but the element of judgment entered so largely into the marks for quality, with the attendant unreliability for scientific purposes, that no use was made of these marks, only the ones for quantity appearing in the tables. In the lower grades it was an easy matter to separate a selection into its distinct thoughts and to find these thoughts either present or absent in

[8] As this experiment was conducted before the Kansas Silent Reading Tests we could not profit by suggestions regarding technique which these tests have made.

the papers and mark them accordingly. In the higher grades, however, this could not be done with nearly as great definiteness and here the teachers were forced to rely partly upon an estimate of the completeness of the paper. This may have introduced a varying condition when the group under one teacher was compared with that under another, though it probably counted for little when both groups were under the same teacher. In the drawing papers grades were also assigned to the papers according to the extent to which the pupil had understood and followed the instructions. Thus the work of each pupil was recorded as to time, which indicated the speed with which he could read, and as to quantity of reproduction, which indicated the effectiveness of his reading. In the tables which follow speed is reduced to number of words per minute.

Computation of Results

The first tests, given at the beginning of the experiment (Nov. 6 and 7) were used to ascertain the degree of equality between the two groups—the "drill" and the "no-drill" groups; the others to measure their degree of equality as the experiment proceeded. All pupils who were absent in any one of the tests were eliminated, except that in two cases where pupils had missed only one half a test (for example the drawing, but not the reading) their grades were computed, on the basis of their results in other tests as compared with the average, and inserted. All persons who were abnormal—either unusually rapid or unusually slow—were also eliminated. In addition the whole of the third grade was eliminated in making the summaries. This was because the drill group in the room with both groups was so small as to make its results unreliable (only five, after eliminations) and because it would therefore have been necessary to depend almost entirely upon a drill group under one teacher and a no-drill group under another. With children so susceptible to the varying abilities of teachers as third grade pupils it seemed best not to include this grade in the general summaries. The results in this grade are given in the tables, though not included in the summaries.

After eliminations there remained, out of the original two hundred and seven, one hundred and thirty-seven in the fourth, fifth and sixth grades and forty-three in the third grade. Thus twenty-seven were eliminated on account of absence or of some abnormality.

Results

The following summaries indicate the results of the four tests. The summaries are also shown in graphical form on charts accompanying this paper. In indicating the rooms the numbers refer to grades, a and w distinguish buildings (w had both drill and no-drill groups while a had only drill groups), and d and n stand respectively for "drill" and "no-drill." All averages are weighted.

TABLE 1

Speed in Reading

Room	Nov. 6	Jan. 20	Apr. 20	June 2
3wn.....	107.6	78.3	165	135.5
3wd.....	105.2	93.5	189	162.6
3ad.....	114.8	126	214	216.4
4wd.....	110.4	252	259	256
4wn.....	126	230	295	199.6
4ad.....	119	320	198	247
5wd.....	256	254.5	288	321.2
5wn.....	269	264	277	294
5ad.....	155	245	236	247.2
6wd.....	164.5	262	179	310
6wn.....	224.5	254	180	315
6ad.....	270	272	137	265
Summary—drill.....	167.7	266.5	219.8	261.4
Summary—no-drill...	201.1	248	253.8	264.9
Speed in Drawing Tests				
4wd.....	314	275	280	159
4wn.....	329	255	268	160
4ad.....	181	171	184	177
5wd.....	181.6	189	315	262.4
5wn.....	287	254	283	257
5ad.....	185	209	262	221
6wd.....	221.2	237.7	257	254
6wn.....	273	217	258	234
6ad.....	178	206	222	223
Summary—drill.....	218.3	218.7	253	209.8
Summary—no-drill...	274.2	242.9	267.3	213.2
Speed in Drawing and Reading Combined				
Average drill g....	193	242.6	236.4	235.6
Av. no-drill g....	237.6	245.4	260.5	239

Quantity of Reproduction in Reading

3wd.....	48.6	91.4	88.5	70
3wn.....	47.6	61	77	89.2
3ad.....	56	58	65.8	71
4wd.....	73	80	78.6	82.4
4wn.....	75.3	71.1	78	82.3
4ad.....	62	84.4	78	73
5wd.....	78	65.7	90	92
5wn.....	72.5	62	88	85.2
5ad.....	68	70	87.6	73.4
6wd.....	58	63	67.3	81.4
6wn.....	57	58	65	74
6ad.....	84	81	50	89.2
SUMMARY— drill.....	69.7	72.2	76.4	81
SUMMARY— no-drill...	68.7	64.2	77.1	80.6

Quality in Drawing

4wd.....	73.9	62.9	67.3	89.2
4wn.....	64.4	70.1	69	92.1
4ad.....	74.7	94	94.4	96
5wd.....	95	95	94	91
5wn.....	94.4	98.2	89	86.5
5ad.....	84	78	91	92.5
6wd.....	96.7	96	98.6	88.3
6wn.....	91	93	97.5	92.1
6ad.....	92	84	90	96
SUMMARY— drill.....	84.4	83.4	87.7	92.2
SUMMARY— no-drill...	82	85.9	84.1	90.7

Quality, Reading and Drawing Combined

Average drill g....	77	78.8	81.5	86.6
Av. no-drill g....	75.3	75	80.6	85.6

The following table shows the relative gain or loss of the drill group as compared with the no-drill group and their distribution throughout the three intervals through which the experiment ran:

TABLE II.

	1st period	2nd period	3rd period	Total
No. of cases of relative gain in speed	16	4	8	22
No. of cases of relative loss in speed	2	8	4	14
No. of cases of relative gain in quality	5	3	5	13
No. of cases of relative loss in quality	7	9	7	23
No. of cases of simultaneous gain in both speed and quality	5	2	4	11
No. of cases of simultaneous loss in both speed and quality	2	7	3	12
No. of cases of inverse relation in speed and quality	5	3	5	13

The above table shows a surplus of cases of gain over cases of loss in speed and hence speaks for the value of the speed drills from that standpoint. It will be noticed that the number of cases of relative gain decreases from the first period to the third while the number of cases of relative loss increases. This is due to the fact that the gains were made largely in the early part of the training period. Thereafter, if the drill group failed, at any test period, to hold all of the advantage which the last test indicated that it had gained the relative drop counted as a loss, even though, compared with the initial relation between the groups, the drill group still retained a significant net gain. Consequently these intermediate relative gains and losses have little significance. They show only where the gains are just about overbalanced by losses. The real story is told by a comparison of the conditions at the beginning with that at the end of the whole training period. In consequence the following table represents the situation more correctly. It gives the number of cases of relative gain or loss in the several periods compared always with the relative standing of the groups at the beginning of the experiment.

	1st period	2nd period	3rd period	Total
No. of cases of relative gain in speed	10	9	11	30
No. of cases of relative loss in speed	2	3	1	6
No. of cases of relative gain in quality	5	7	7	19
No. of cases of relative loss in quality	7	5	5	17
No. of cases of simultaneous gain in both	5	6	7	18
No. of cases of simultaneous loss in both	2	1	0	3
No. of cases of inverse variation	5	5	5	15

The single case of net relative loss in speed in the last period on the part of the drill group as compared with the no-drill group was an instance where a group in one building, under one teacher,

was compared with a group in another building under another teacher, and where, consequently, conditions were unpropitious for experiment. Even there the loss was very slight.

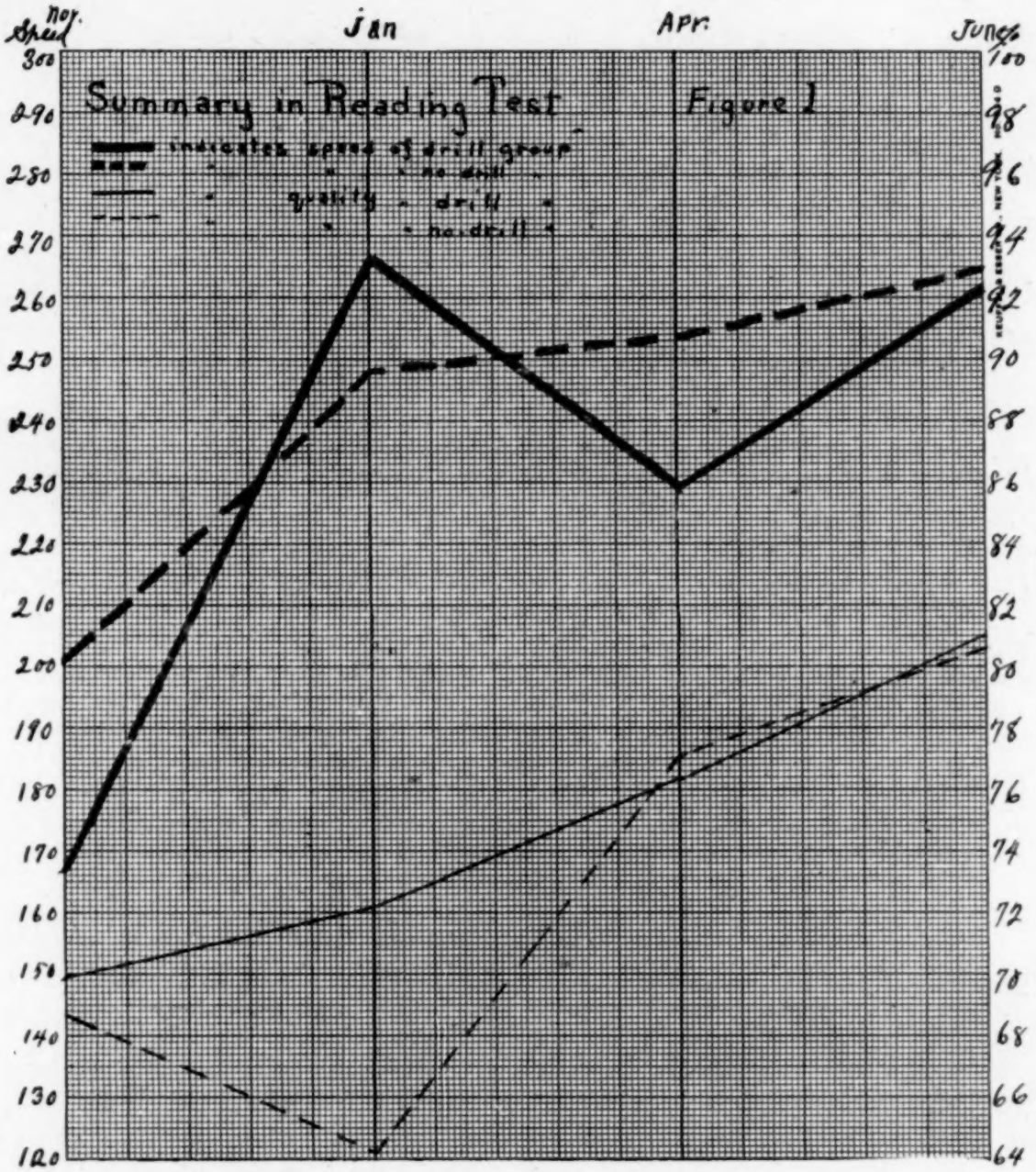
The following table summarizes in convenient form the results of the experiment. The relation between the groups at each stage is expressed in per cent., in which the work of the no-drill group is used as the base. Thus under speed in reading the table indicates that the drill group could read 83.8% as rapidly as the no-drill in the beginning, 107.5% as rapidly after two months, etc.) This table shows a relative gain of 18.7% in speed but a trifling loss in quality as the result of the speed drills.

	1st test	2nd test	3rd test	4th test	gain
		Speed			
Reading test	83.5	107.5	86.6	98.7	14.9
Drawing test	76	90	94.6	98.4	22.4
Total	79.9	98.7	90.6	98.6	18.7
		Quality			
Reading test	101.5	112.4	99.1	100.5	—1
Drawing test	102.9	97.1	104.3	101.7	—1.2
Total	102.2	105.1	101.1	101.1	—1.1

Observations on the Experiment

1. The comparison between groups in different buildings, and under different teachers, is by no means ideal for experiment. It does not insure that all factors besides the one experimented upon remain constant. Altogether apart from the effect of the specific drills pupils may, under such diverse conditions, make different degrees of progress. Hence those cases in this experiment which compare two groups under the same teacher are the more trustworthy.

2. It was not possible to keep conditions absolutely constant even through the tests. For these tests consumed over an hour in time, and the degree of fatigue doubtless varied somewhat within as long a period as that. Hence the group tested first may have been either more or less alert than the group tested second. Besides the fact that the test had been running for some time in the room would tend to make it monotonous, or otherwise different, and this may have affected the results. It occurred to me afterwards that this disturbing factor might have been reduced to a minimum by taking sections alternately out of the drill and the no-drill groups, instead of testing all of the one group first and all of the other group later. This, however, was not thought of in time.


Nov.
Speed
Jan
Apr.
June
Summary in Reading Test
Figure 1
indicates speed of drill group
" " no drill
quality " drill
" " no drill
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
100
98
96
94
92
90
88
86
84
82
80
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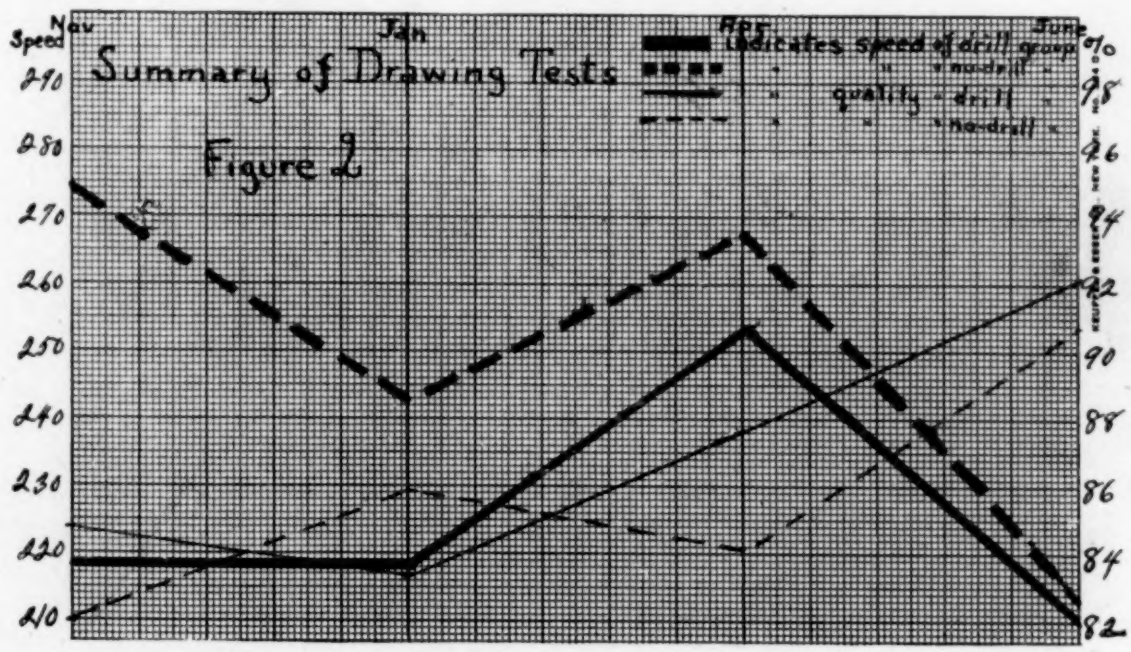
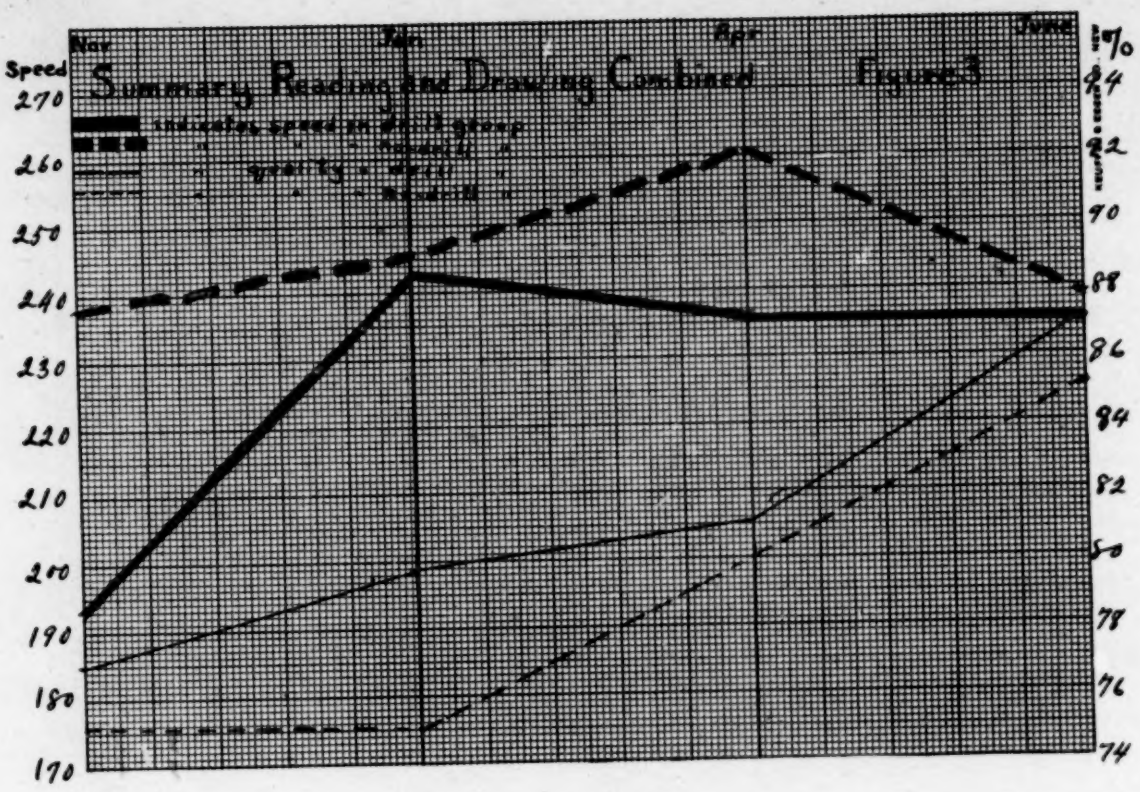
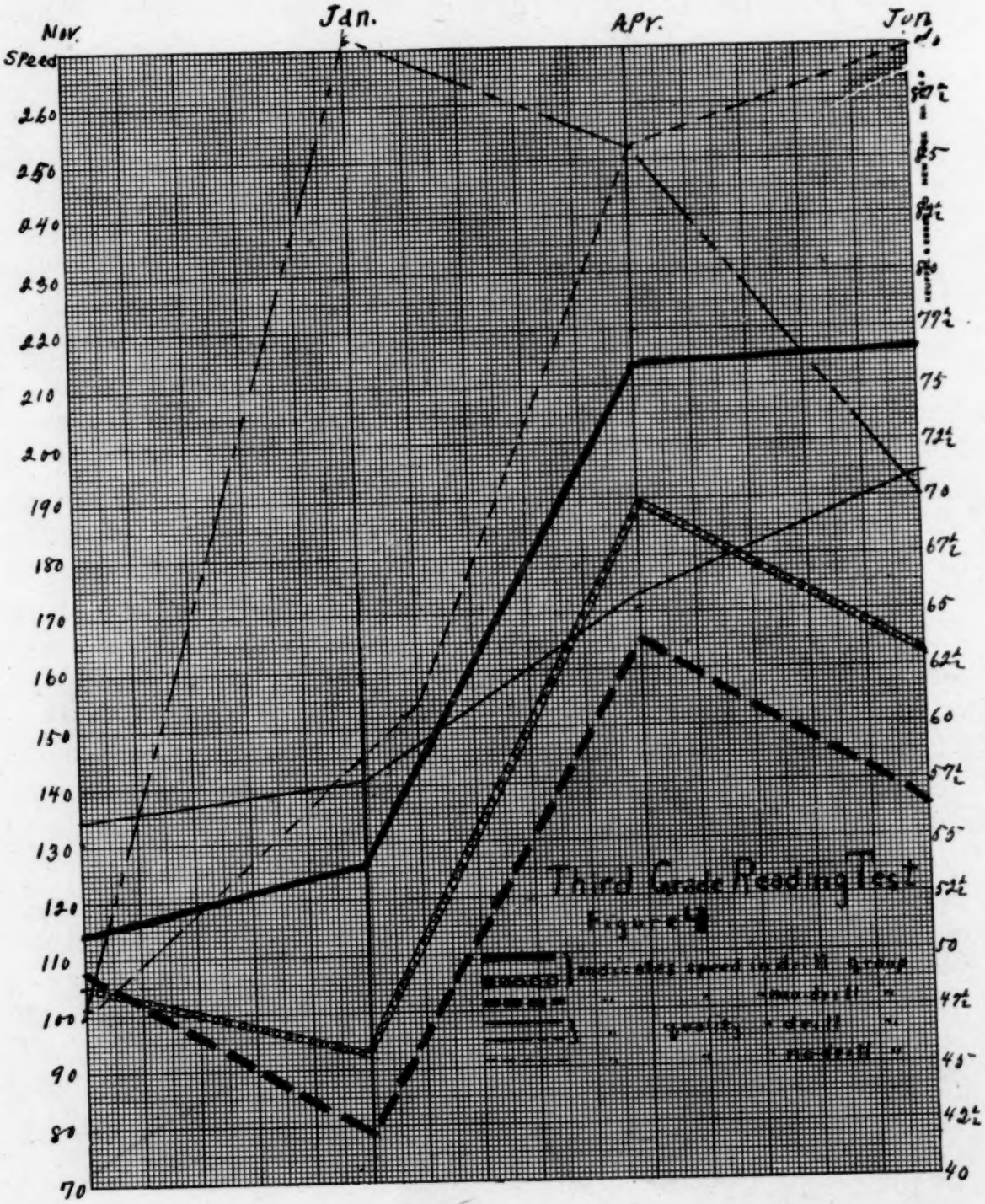
76
74
72
70
68
66
64


Nov
Speed
Jan
Apr
June
Summary of Drawing Tests
Figure 2
indicates speed of drill group
" " no drill
quality " drill
" " no drill
290
280
270
260
250
240
230
220
210
100
98
96
94
92
90
88
86
84
82


Nov
Jan.
Apr
June
Speed
Summary Reading and Drawing Combined
Figure 3
indicates speed in drawing group
" " reading " "
" " quality " "
" " drill "
270
260
250
240
230
220
210
200
190
180
170
%
94
92
90
88
86
84
82
80
78
76
74


Nov.
Jan.
Apr.
Jun
Speed
Third Grade Reading Test
Figure 4
indicates speed in drawing group
" " reading "
" " quality "
" " drill "
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
%
80
77½
75
72½
70
67½
65
62½
60
57½
55
52½
50
47½
45
42½
40

3. A peculiar departure from the general trend of the results of the experiment occurs in the showing of the third test. Here the drill group loses on the average almost as much as it had gained in the first period and simultaneously loses in quality. There are eight cases of relative loss in speed in reading against four of gain, while in the other two periods this proportion is reversed or better. The quality fares almost equally badly. Indeed there are seven cases of simultaneous loss of speed and quality here while there were only two in the first period and three in the last. It was during the preceding period that a large proportion of the pupils were out with contagious diseases, but a study of the aggregate number of days missed by both groups showed that the no-drill group missed not less but slightly more time than the drill group, so that that could not explain the matter. Another factor which might possibly have some bearing was the fact that the teacher in the room departing most widely from the expected was called out of the room for a short time while the test was in progress, but, from studying carefully the attendant conditions, we could not convince ourselves that that could have seriously affected the results. But I suspect that the true explanation lies in a difference in our mode of approaching this test as compared with the others. In earlier tests pupils were allowed to read normally. They were not urged to go rapidly. In this third test, however, by the advice of the seminar,[9] all pupils were urged, when they sat down to the test, to read as rapidly as possible. It is true that this exhortation was given to both groups but, in as much as it was new to the no-drill group and an everyday occurrence to the drill group, it may have acted as a more effective spur to the former than to the latter, and thus unbalanced the conditions. If this is the correct explanation it emphasizes two things: first, the great extent to which both speed and effectiveness of reading respond to added effort, and, second, the extreme caution which an experimenter must exercise to keep conditions constant in his two groups. What appears to be but a trivial matter may really be of enough consequence to vitiate the whole experiment.

4. An examination of the data given for the third grade (not included in the summaries) shows a decided gain in speed (22.5%)

[9] The seminar in Educational Research conducted by Professor Yocum at the University of Pennsylvania, of which the writer was a member at the time.

but also a considerable loss in quality (14.7%). This may indicate that the habit of reading rapidly is most easily formed at this early age, but that this rapidity is gained at the expense of accuracy, or it may be due merely to the untrustworthy conditions which attended this part of the experiment, as noted before.

5. This experiment has not confirmed the doctrine that increase in speed will carry with it, in any given individual, also increase in effectiveness.[10] , It is not improbable that differences in reading speed are only indicative of more fundamental differences[11]—differences in sluggishness of thinking—and that the best that can be done, as the result of speed drills, is to bring up the speed more nearly to the possibilities of the particular individual, but that the naturally slow reader can not be developed into a rapid one without impairing his effectiveness. Whether, and how, slow readers differ from fast ones in their mental characteristics needs to be determined by experiment.

6. It is not improbable that an added effort to control the mechanics of reading—that is eye movements—would show even better results in speed. It is also probable that it is worth while to teach children to "skim." That must be determined by separate experiments. But the present investigation, showing a relative improvement of 18.7% in speed, without injuriously affecting the quality, as the result of the drills, strongly suggests the advisability of giving speed drills as a part of the teaching of reading.

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[10] For an account of an experiment which seems to confirm this one see IRVING KING, *A Comparison of Slow and Rapid Readers*, School and Society, Nov. 25, 1916, pp. 830–4.

[11] Thorndike found this true of speed and accuracy in arithmetical processes. See Journal of Educational Psychology, Feb., 1914.

COMMUNICATIONS AND DISCUSSIONS

RESULTS IN SILENT VERSUS ORAL READING

The June, 1915, JOURNAL OF EDUCATIONAL PSYCHOLOGY gave the results in silent and oral reading with one hundred and twelve sixth-grade pupils of the Cincinnati schools tested in May, 1914. The purpose was to find by which method pupils were able to reproduce the more points included in the "Alice in Wonderland" material read. If they read more lines silently than orally, would they not only reproduce more points, but would they be able to reproduce a greater per cent. of possible points covered? Six two-minute tests were given in each of the methods of reading. Without exception, each class (five) reproduced a greater percentage of possible points by the silent method. Seventy-one per cent. of the children taken separately did better by this method.

In May, 1915 and 1916, the same tests were conducted with three hundred and forty pupils from the third to the tenth grade, the ninth not included. These tests were identical in every way with the above except that each of the six in 1915 and 1916 was for one minute instead of two as in the case of the one hundred and twelve sixth-grade pupils. Fifteen out of seventeen classes did better by the silent method of reading. Seventy per cent. of the children taken separately did better by this method. The results by grades are given in Table I. The last column shows the per cent. of points each pupil did better by the silent method of reading.

CYRUS D. MEAD

University of Cincinnati.

TABLE I.

Silent Versus Oral Reading

May, 1915 and 1916

(Six One-Minute Tests)

		Silent				*Oral*			Per Cent. Difference Oral as Base	
Grade	No.	Aver. Years	Aver. No. Lines Rd.	Aver. No. Pts. Repd.	Per Cent. Pts. Repd. of Pts. Read	Aver. No. Lines Rd.	Aver. No. Pts. Repd.	Per Cent. Pts. Repd. of Pts. Read	Total	Average
3	20	9.2	17.04	6.4	34.2	14.6	5.7	33.9	7.0	.35
4	20	10.1	27.0	7.2	23.9	17.4	8.7	35.0	—223.2	—11.1
5	18	11.1	15.7	7.9	45.57	13.1	5.86	39.38	111.4	6.19
5	21	11.9	25.5	11.7	43.1	20.3	8.5	36.2	143.8	6.8
5	21	11.4	25.2	9.9	35.7	18.38	6.6	30.19	114.	5.5
6	20	13.2	24.8	8.2	29.7	20.4	6.5	24.9	96.7	4.8
6	16	13.2	22.5	11.06	44.38	18.1	9.65	43.52	13.6	.85
6	20	11.7	29.5	14.2	45.1	22.5	11.3	46.0	—18.1	—.905
7	20	13.0	21.4	10.6	45.4	19.6	9.6	43.8	35.4	1.7
7	20	13.3	27.1	10.8	37.3	19.8	7.5	33.5	74.6	3.7
7	23	13.8	23.4	10.3	38.0	22.0	7.6	30.4	158.	6.9
8	20	15.0	31.1	22.5	66.0	24.2	15.8	51.4	293.0	14.6
8	20	13.4	26.0	16.7	56.9	23.0	14.5	54.3	52.4	2.6
8	20	14.1	22.7	13.7	58.0	22.8	11.5	45.3	254.0	12.7
8	20	13.8	25.2	15.6	55.1	20.2	11.7	50.5	93.1	4.6
8	21	14.0	25.6	13.3	46.7	23.0	10.1	39.8	146.0	6.95
10	20	16.0	21.2	13.8	56.6	20.3	11.8	49.7	139.9	6.99

The last column shows the per cent. of points each pupil did better by the silent method.

ABSTRACTS AND REVIEWS

RECENT LITERATURE ON READING

1. William Anton Schmidt. *An Experimental Study in the Psychology of Reading.* Supplementary Educational Monographs. Vol. 1, No. 2, April, 1917. Chicago: University of Chicago Press. Pp. iv, 126. Seventy-five cents.
2. William Scott Gray. *Studies of Elementary-School Reading Through Standardized Tests.* Supplementary Educational Monographs, Vol. 1, No 1, 1917. Chicago: University of Chicago Press. Pp. viii, 157. $1.00.
3. M. E. Haggerty. *Scales for Reading Vocabulary of Primary Children.* Elementary School Journal, 17: No. 2, October, 1916. 106–115.
4. Richard Zeidler. *Tests in Silent Reading in the Rural Schools of Santa Clara County, California.* Elementary School Journal, 17: No. 1, September, 1916. 55–62.
5. Melvin E. Haggerty. *The Ability to Read: Its Measurement and Some Factors Conditioning It.* Indiana University Studies, No. 34, January, 1917. Pp. 63. Twenty-five cents.
6. William S. Gray. *The Relation of Silent Reading to Economy in Education.* Sixteenth Yearbook of the National Society for the Study of Education. Part I, 1917. 17–32.
7. Alva M. Richards and Percy E. Davidson. *Correlations of Single Measures of Some Representative Reading Tests.* School and Society, 4: September 2, 1916. 375–377.
8. William S. Gray. *A Coöperative Study of Reading in Eleven Cities of Northern Illinois.* Elementary School Journal, 17: No. 4, December, 1916. 250–265.
9. Irving King. *A Comparison of Slow and Rapid Readers.* School and Society, 4: November 25, 1916. 830–834.
10. E. J. Llewelyn. *Reading in the Mount Vernon, Indiana, City Schools.* Elementary School Journal, 17: No 2, October, 1916. 123–127.
11. W. L. Uhl. *The Use of the Results of Reading Tests as Bases for Planning Remedial Work.* Elementary School Journal, 17: No. 4, December, 1916. 266–275.
12. William S. Gray. *Emphasis on Reading Instruction.* Elementary School Journal, 17: No. 3, November, 1916. 178–186.

The recent activity in the experimental investigation of reading in the schools is evidence that school authorities are becoming more keenly aware of the importance of this subject in education, and more anxious to test the results that are obtained from present methods of instruction. Reading and handwriting have been more carefully investigated by psychologists than any other school subject. The eye movements involved in reading have been recorded by several investigators, but most of the experiments were conducted on adults. Schmidt (1) with a modification of the Dodge photographic apparatus has made an elaborate study of the eye movements of over eighty individuals drawn from the university, high school and elementary school, as far down as the second grade. Eye movements were studied in both oral and silent reading with different kinds of material. Oral reading was found to require 1.6 more pauses per line than silent reading, and the average duration of these pauses was from 20 to 27 per cent. greater. Further, it was found that oral reading requires from 44 to 64 per cent. more perception time than does silent reading. The monograph contains a carefully compiled bibliography of previous investigations of eye movements, and a well digested historical sketch of other experimental work in this field.

While the physiological factors involved in reading are undoubtedly important and call for further study in many particulars, it is the determination of reading ability through standard tests that has aroused the greatest interest in the subject. Dr. Gray's monograph (2) is the most elaborate discussion of tests in reading that has yet been issued. His summary of previous investigations covers 23 pages, and is followed by a carefully annotated bibliography of 48 numbers. This chapter gives a very complete account of the derivation and applicatoin of reading tests to the present time. Dr. Gray was the first to devise a test for oral reading, and while the test was described in Judd's *Measuring the Work of the Public Schools* (The Cleveland Survey), this is the first detailed account of the derivation of the test and its validity. The silent reading test is unique in that the selections have been experimentally chosen for the grades for which they are intended; the rate of reading is determined by the time taken to read a standardized portion in the middle of the selection, thus giving a paragraph before and after the significant reading of the test; and the degree of comprehension is determined by a combination of reproduction and answers to questions on the passage. The most interesting and important part of the monograph for educa-

tional psychologists is chapters IV and V, on the validity of the oral and the silent reading tests. Here the author describes in detail the preliminary experimentation in the selection of test material, the determination of the steps of difference in difficulty between the paragraphs, and the validity of the scale as indicated by the agreement between the theoretical and the ascertained values. Chapter VI repeats in somewhat greater detail the report on the Cleveland Survey, and chapter VII discusses such special problems in reading as periods of growth in reading achievement, rates in oral and silent reading, and the relation of growth in oral-reading ability to comprehension of subject-matter read. The study sets a high standard for the Chiccago Educational Monographs and must be carefully studied by every experimentalist in education.

In his study of the reading vocabulary of primary (I B) children, Haggerty (3) made use of the minimum vocabulary tests proposed by Jones in the Fourteenth Yearbook of the National Society for the Study of Education. These lists consisted of 118 "phonetic" words and 236 "sight" words, selected on the basis of the frequency with which they occurred in ten standard primers. The lists were given to seven hundred low first-grade children, and on the basis of percentage of correct responses scales were constructed which consist of nine steps for the phonetic words and twelve steps for the sight words. On the basis of these results abbreviated scales were constructed with five words in each step and five or six steps in each scale. These scales would seem to offer very promising material for determining the degree of familiarity with printed words which pupils possess on their entrance to school.

In his study of silent reading in rural schools Zeidler (4) made use of the Starch reading tests. The tests were given to from 100 to 200 pupils in each grade from III to VIII. Twenty-six schools were involved in the test. Instead of giving the selection which Starch indicates for each grade, selection number 3 was given to grades III and IV, number 5, to grades V and VI, and number 7, to grades VII and VIII, while selection number 5 was also given to grade IV and number 7, to grade VI. This overlapping gave a check on the results obtained from each grade by single tests. In the evaluation of the reproduction each element of each selection was weighted in terms of the combined judgments of university faculty men. The results of the tests showed that in rate of reading, the elementary pupils fall somewhat below the standard scores given by

Starch, but are equal to those obtained from pupils of the same grade in the town of San Jose. In reproduction, however, the scores are distinctly lower than those from pupils in town schools. This is the more significant in that a detailed comparison of scores grade by grade reveals a high coefficient of correlation. The larger and better organized schools make a distinctly better showing than the small, one- and two-teacher schools.

The report of Haggerty (5) gives an account of the application of the Thorndike reading tests in twenty Indiana cities. The tests given were the visual vocabulary, preliminary and scale A, and the understanding of sentences, preliminary and scale Alpha, sets a, b, c, and d. The method of scoring is illustrated by the individual tabulation of results from typical classes, and charts present the median scores for each grade from the third to the eighth in each of the eighteen cities. The usual picture of the overlapping of abilities in the different grades, made familiar by the work of Courtis in arithmetic and by Starch in various school subjects, is brought out with great clearness in these results .Whether this overlapping is evidence of "the unsatisfactory character of the grading of children," as the experimentalists charge, is a matter that calls for further investigation. Undoubtedly students are badly graded for reading alone, or for addition alone, or for spelling alone. But with our present school organization it is impossible to have gradings of pupils for each school subject, and no one has yet attempted to obtain a combined measure of the attainments of pupils in all their subjects to determine from the administrative stand-point how well they are graded. This is a task for some enterprising superintendent to undertake. It would be interesting to see what would be the result of grading and promoting pupils of a school system for a period of years strictly on the basis of the combined results of educational tests. On the question of speed versus accuracy the author comes to the negative conclusion that inaccuracy is not a necessary correlative of rapid work nor is slow work a guarantee of correctness. The proper adjustment of speed and accuracy seems to be a highly individual matter. Mere increase in age does not carry with it increase in vocabulary, for in general the youngest children in each class are superior to the oldest. Comparison of the sexes shows a slight but constant superiority in favor of the girls.

The significance of reading tests for practical schoolroom problems is discussed by Gray (6) in his consideration of economy of time.

Substantially all investigations show that silent reading is a more rapid process than oral reading, and the preponderance of evidence inclines to the view that the rapid reader is usually more efficient than the slow reader. It is true that in the beginning reading must be predominantly oral. The rate of both oral and silent reading increases rapidly during the lower grades and tends to reach a maximum in the higher. The comprehension of what is read improves steadily throughout the grades and can be materially increased by training. Tests of speed and quality of silent readings should be made at frequent intervals in order to determine the most urgent instructional needs of the children.

With so many reading tests now in the field a comparative study of the results of these tests on the same pupils would be enlightening both as a basis for a criticism of the tests themselves, and as a step in determining their desirability as measures of reading ability. An initial study of this type has been made by Richards and Davidson (7) on 400 third- and fourth grade California children. The tests used were the Starch reading tests for the third and fifth grades, the Kelly tests for the third, fourth and fifth grades, the original Trabue Completion Test, a vocabulary test patterned after Thorndike's, and a narrative completion test. It will be seen that only the Starch and Kelly tests are properly strict reading tests, although the others may involve abilities upon which effective reading depends. In general the correlations, determined by the Spearman Footrule method, are rather low, ranging from .25 to .42. Interestingly enough, the lowest correlation is that between the Starch and Kelly tests, while the highest is between the Trabue and the Narrative completion tests. The authors are careful to point out that no one knows to what extent any of these tests is a measure of reading ability, but the results reinforce the conviction already expressed by some writers that the Starch and Kelly tests do not measure the same kind of thing. More extensive comparisons of reading tests are greatly to be desired.

Another coöperative study of reading was carried out under Gray's supervision (8) by a committee of the Illinois State Teachers Association. The Gray tests for both oral and silent reading were used, but the scores for oral reading were based entirely upon rate and errors, with no attempt at reproduction. A comparison of the average scores with those obtained from other cities shows that they are distinctly low in both oral and silent reading. Another feature of the

scores is the wide variation shown by classes of the same grade. Some third-year classes, for example, are fully two years in advance of others. This seems to be due partly to the success of the teacher in inspiring the pupils with a zest for reading, and partly to the amount of attention that is paid to securing a proper balance between rate and accuracy. Teachers need to have objective standards of attainment defined for them in each grade, and should be urged to make frequent critical studies of the results of their teaching. There should be initial tests at the beginning of each term, comparison of the results with standards attained in other communities, and tests of progress at intervals throughout the term. The standing of the Illinois schools in silent reading was distinctly lower than in oral reading. A greater quantity of reading with emphasis on thought comprehension is recommended for the second and third grades, with increasing practice in silent reading.

Gray inclines to the view that rapid readers get the most out of what they read. Shall we, then, try to develop as great speed as possible in each pupil? King (9) investigated the relation of speed and accuracy in 94 college students. These were divided into a fast and a slow group by requesting each alternate student to read slowly and carefully, while the others were to read rapidly and carefully. In the ten minutes allowed the "slow" group were requested not to read beyond a certain point. A clock was before them, and if they found themselves reading too fast they were to slow down. The "fast" group were to read twice as far, and to speed up if they found themselves getting behind. At the end of the ten minutes it was found that each group of students had read approximately what was expected of them.

Both groups were then tested for comprehension of what they had read. This test consisted in replies to mimeographed questions on the passage. It was found that the "fast" readers replied with an average accuracy of 44.5 per cent., the "slow" readers with 53.3 per cent. Analyzing the results a little more closely and calling those good who got more than fifty per cent. correct in each proup, and those poor that got less than fifty per cent. correct, it was found that twenty-one good "slow" readers averaged 65 per cent., and seventeen good "fast" readers averaged 61.5 per cent. Of the poor reproducers those in the "slow" group averaged 43.9 per cent., and those in the "fast" group averaged 35 per cent. From these figures the author concludes that the slow readers are superior to the rapid readers in the amount that they get from the reading.

It is obvious that this test gives little information as to the relative merits of *naturally* slow or fast readers. Inquiry showed that there were naturally slow and fast readers in both groups. As a result the rapid readers in the "slow" group would have opportunity to re-read much of the passage and thus partly memorize it. This would tend to increase the reproduction score of the "slow" group. On the other hand, the slow readers in the "fast" group would find themselves quite out of their element, and would be obliged to skim over the lines so rapidly that they would be unable to give any intelligent account of the passage read. This, therefore, would tend to pull the score of the "fast" group down. In view of the fact that the "fast" group read twice as much in the given time as the "slow" group the surprising thing is not that the "slow" group had a better accuracy score, but rather that the results were not farther apart than the figures indicate.

In a second test the class was divided into naturally fast and slow readers on the basis of a preliminary experiment. All were started reading at the same time and were stopped after five or six of the fastest readers had finished. Wide differences in rate were found, the extremes having the ratio of 5 to 12. All were tested with questions on the passage. The fastest 25 per cent. of the group showed an accuracy of 50.2 per cent., while the slowest 25 per cent. had an accuracy of 48 per cent. The middle fifty per cent. had an accuracy of only 46.5 per cent., and when the entire class was ranked for speed and accuracy the Pearson coefficient of correlation was $r = -.07$. While the author seems to think that the results are in favor of the slow readers, a more careful consideration of the entire experiment leads rather to the conclusion that the advantage is strikingly with the group of naturally fast readers. Whether the rate of reading could be increased with practice without any reduction in efficiency is a question on which the experiment throws no light.

Llewelyn (10) concluded from general observation (no tests were used) that the poorest reading was to be found in the fourth, fifth and sixth grades. A conscious effort was made to correct this by giving more attention to silent reading and less to oral reading in these grades. What oral reading was done was motivated by allowing the child to read to the class something in which he thought the class would be interested. Much of the time of the reading period was devoted to suggestions about preparing the lesson, and to a discussion of the lesson already prepared. The teachers also encouraged the

pupils to read extensively in books procured from the public library. Four months of this procedure resulted in a great increase of interest in reading by the pupils, a marked increase in the circulation of library books, a growth of interest on the part of teachers in teaching the subject, and more careful and thorough preparatoin by teachers for the reading periods. While the oral reading showed no improvement, the intellectual tone was greatly benefited.

Uhl (11) made use of the Kelly reading tests with the pupils of grades III–VIII to select those who needed especial attention in reading. The number of pupils in each grade ranged from 14 to 25. To those who stood especially low in each grade, the Gray oral reading test was given, and to some of these who pronounced fairly well but did not seem to comprehend what they were reading, the Gray silent reading test was given. It was found that several bright pupils made low scores on the Kelly tests because of chance conditions. The author makes an extended diagnosis of typical cases of individual defect. Some made low scores on account of extreme care, other on account of extreme carelessness. On the basis of this diagnosis the pupils were given an intensive drill focussed especially upon their individual defects. At the end of the term the tests were given again. The most of those drilled showed material gains. A detailed analysis of these gains leads the author to think that the Kelly tests are true measures of reading ability and not tests of general intelligence as claimed by some.

Educational tests are significant only in so far as they modify or throw light upon the processes of instruction. Gray (12) has made a comparison of the scores from his reading tests in Cleveland and St. Louis to bring out differences in emphasis on various phases of reading instruction in the two cities. The results show a constant and uniform superiority in oral reading in every grade of the St. Louis schools. A closer analysis shows that Cleveland emphasizes speedy association of pronounced word with printed symbol. In St. Louis, on the other hand, greater deliberateness and certainty are striven for, and are attained to such a degree as to put the pupils from one eighth to one-half year ahead of the corresponding grades in Cleveland. In silent reading, the rate is for the most part in favor of Cleveland, but in accuracy St. Louis is markedly superior in every grade.

It will be readily seen from these recent studies of the measurement of reading ability what a valuable instrument of precision is here afforded the school superintendent, principal or teacher, for deter-

mining the status of the attainments of pupils and the amount of improvement made as the result of a given type of training. As yet we are only at the beginning of the derivation and utilization of such tests. We do not yet know the degree of reliability of single tests, nor have there been sufficiently extensive comparative studies of the various tests to enable us to determine which test affords the better indication of reading ability. With the many workers who are now turning their attention to this subject, experimental studies will multiply rapidly and in a few years the teaching of reading will be placed upon a scientific basis scarcely dreamed of a decade ago.

J. C. B.

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EDITORIALS

THE TEACHING OF READING

One outcome of recent school surveys is the added attention to instruction and attainment in elementary school subjects. Not the least important of these is reading. Investigations have been carried on to determine the points of strength and weakness in the existing methods of instruction, and the legitimacy of the effort expended in relation to the product. Questions arise of whether the objective point in teaching reading should not be varied from grade to grade; whether teaching of reading as it has been rather uniformly carried on in the grades has of itself reared any barrier to the ends sought; whether *what* one reads rather than *how* one reads is not the important element; and wherein lies the chief value of reading that it shall absorb so large a part of the time spent in school. These problems might well be considered by high school teachers whose tendency has been to over-emphasize the analysis of the classics rather than to stress reading for purposes of gathering ideas and using them for revelations in other fields.

Reading in the public schools has been in the past largely a matter of securing effective oral expression, and while schools do not aspire

to the results attained by teachers of expression, formerly called "elocution," yet all the gymnastics attendant upon the mechanics of expression have had their share of attention. Vocal accompaniment to the getting and reproducing of thought has often been the criterion by which advance in reading has been estimated. Again, the mechanics of reading has received attention on the side of quick association of symbol and pronunciation to the exclusion of comprehension. To realize the efficiency of reading in relation to other subjects one must establish anew the value of reading in intellectual attainment and practical achievement. If it is conceded that efficient grasp of content is the chief function of reading, one may then shift the emphasis from correct and fluent vocalizing to mastery of the ideas expressed.

Efficiency in grasp of content must include rate of reading as well, since extensiveness can not be unduly sacrificed to intensiveness. Comprehension and retentiveness are included in this also. What do investigations show to be necessary for success in acquiring ability to read?

Briefly, it has been found that attention must be given to habits of visualizing the printed page, to increasing the span of attention, to the exercise of alertness in mastery of the content, and to individual differences. Awkward and wasteful habits which hinder rapid reading must be counteracted. The knowledge that the articulation of the child in the first grade is quite comparable to that which he will have in the eighth grade, or as an adult, might justify the abandonment of the attempts throughout the school to raise the achievement in that direction. Increase in rate is slow after the fifth grade; comprehension regularly increases from lower to upper grades. Opportunities for development in mechanics are possibly the greatest in grades three and four. Tests tend to stimulate achievement in speed rather than comprehension. Silent reading, with which little has been done, has not yet had its technique mastered by teachers, although they have realized the validity of its claims.

Such findings and recommendations as are here suggested are carefully elaborated in the Cleveland Survey by Judd and Bobbitt. As Dr. Judd remarks in commenting on the situation in Cleveland, since "American schools are chiefly reading schools," different from European in the amount and character of oral instruction, it is well worth while to know what constructive effort can be expended to secure the greatest good at all points along the line from grade to grade.

G. M. W.

NOTES AND NEWS

The British Medical Journal reports that an investigation on the annual growth of the brain on the living subject between the ages of six and twenty-one years has recently been inaugurated by Professor Berry of Victoria University, Australia. The research has entailed the examination of 1700 boys and girls. The director of education has been sufficiently interested in the preliminary results submitted to him to promise the coöperation of his department for the further prosecution of the work, and arrangements are now completed for a considerable extension of the investigation during the current academic year. As Mr. S. D. Porteus, of the Bell Street State School for mentally deficient children, has taken an active part in the investigation there is, for the first time, the necessary combination of the physical and mental experts.—*School and Society.*

The Edinburgh University Court has agreed to approve the draft regulation submitted for the degree of bachelor of education and for the university diploma in education.—*School and Society.*

Announcement is made of the publication of *Psychobiology,* a bimonthly journal devoted to the field common to psychology and the biological sciences. The new journal is edited by Professor Knight Dunlap, of Johns Hopkins University, in association with John J. Abel, Johns Hopkins Medical School, Walter B. Cannon, Harvard Medical School, Raymond Dodge, Wesleyan University, Shepherd I. Franz, Government Hospital for the Insane, Herbert S. Jennings, Johns Hopkins University, and George H. Parker, Harvard University, and is published by Williams and Wilkins Company, Baltimore.

The San Francisco Polyclinic has opened a mental hygiene clinic under the direction of Dr. Lillian J. Martin. Among the aims of the clinic we note elimination of injurious mental and physical habits; increase of individual power in observation, attention, concentration, memory and will; aid to mothers and teachers in educating and managing, not alone their nervous children, but also those who are healthy, through applying the results of recent investigations along the lines of heredity and mental diseases; assistance to students and others in adjusting themselves to their work; and aid in the selection or change of a vocation.

At the April meeting of the New York Branch of the American Psychological Association the following papers were presented: "The Speed and Accuracy of Motor Adjustment," by J. J. B. Morgan; "Student Ratings of One Another with Reference to Prospective

Teaching Ability," by G. C. Myers; "Some Problems in Dream Interpretation," by L. H. Horton; "The Law of Effect in Relation to Neuroses," by T. H. Ames; "Effects of Alcohol on Animal Behavior," by Halsey Bogg.

Among the visiting members of the faculty at the summer session of Washington University will be Daniel E. Phillips, head of the department of psychology and education at the University of Denver, and Fred C. Ayer, professor of education in the University of Oregon.

Dr. Francis Wayland Shepardson, associate professor of American history in the University of Chicago, has been appointed by Governor Lowden, of Illinois, to be director of the department of registration and education, one of the nine departments under which the administrative work of the state has been grouped. On the educational side the department covers the work of the five normal schools, the state geological survey, the state museum of natural history, and other scientific undertakings under state auspices.

Professor William C. Bagley, director of the school of education, University of Illinois, has accepted an appointment as professor of education in Teachers College, Columbia University. Professor Bagley will organize a new department of education in connection with the work of normal schools and teachers' training classes.

Professor W. W. Charters, dean of the school of education of the University of Missouri, has accepted the position of professor of educational administration at the University of Illinois.

Dr. Truman Lee Kelley, adjunct professor of educational psychology at the University of Texas, has been appointed assistant professor of education at Teachers College, Columbia University. Dr. Kelley's work will be concerned with statistical and psychological problems in the field of secondary education.

Dr. A. H. Sutherland, of Yale University, has been appointed psychologist in the public schools of Los Angeles, California.

Dr. George R. Wells, associate professor of psychology in Oberlin College, has been appointed to a new professorship in psychology at the Ohio Wesleyan University.

Dr. C. E. Ferree, of Bryn Mawr College, has been promoted to a full professorship of experimental psychology at that institution.

Dr. Arnold L. Gesell, professor of child hygiene at Yale University, who has been absent for the past two years on account of illness, will resume his work next fall.

Dr. William Scott Gray and Dr. Harold Ordway Rugg have been promoted to assistant professorships in the department of education at the University of Chicago. Dr. Gray is dean of the college of education.

Dr. Raymond Dodge, professor of psychology at Wesleyan University, has been appointed to the Ernest Kempton Adams research fellowship at Columbia University.—*Science.*

Dr. Edward Herbert Cameron, assistant professor of education at Yale University, will be a member of the summer faculty at the University of Chicago.

Dr. F. W. Ballou, recently elected associate superintendent of schools in Boston, will give courses in educational measurements at the Harvard University summer school.

Dr. Louis W. Rapeer, professor of education at the Pennsylvania State College, has been appointed dean of the University of Porto Rico.

Dr. Roswell P. Angier has been promoted to a full professorship in psychology at Yale University.

Professor Edward L. Thorndike, of Teachers College, Columbia University, has been elected member of the National Academy of Sciences.

Dr. Robert M. Yerkes, assistant professor of psychology in Harvard University and president of the American Psychological Association, has accepted an appointment as professor of psychology and director of the psychological laboratory at the University of Minnesota.

Professor Ernest C. Moore, of Harvard University, has been elected president of the Los Angeles State Normal School, with the understanding that he is to transform the institution into a teachers college.

Dr. J. E. W. Wallin, of the educational clinic connected with the St. Louis schools, will offer courses in clinical psychology and on subnormal children in the State University of Iowa during the summer session.—*School and Socieiy.*

Dr. Charles R. Mann, professor of physics in the University of Chicago, who for the past three years has been on leave of absence to make a report on engineering education for the Carnegie Foundation, has been called to the Massachusetts Institute of Technology to be chairman of a committee of the faculty charged with the special duty of considering ways and means of improving methods of instruction.—*School and Society.*

PUBLICATIONS RECEIVED

EDITH ABBOTT AND SOPHONISBA P. BRECKINRIDGE. *Truancy and Non-Attendance in the Chicago Schools. A Study of the Social Aspects of the Compulsory Education and Child Labor Legislation of Illinois.* Chicago: The University of Chicago Press, 1917. Pp. xiii, 472. $2.00.

This is an interesting study of compulsory school attendance from a broad social point of view. Part I discusses the legal aspects of compulsory education and outlines the history of the movement for compulsory school attendance in the State of Illinois from 1818 to 1916. It is interesting to note that in the past two decades the enforcement of the compulsory education laws and the passage of child labor laws have gone hand in hand. Part II deals with present conditions and methods of treatment. There is, first, a study of truancy and non-attendance on the basis of the records of nine selected schools. There are, further, chapters on the relation of truancy and non-attendance to the transfer system, to the mental and physical defects of children, and to dependency and delinquency. The functions of the parental schools, the municipal court, the school census and the visiting teacher are considered as agencies for the enforcement of the school law. A strong plea is made for compulsory education between the ages of fourteen and sixteen. The authors urge that the issuance of working papers be taken from local school superintendents and given over to the state educational authorities; that not only should there be a minimum age of sixteen but a minimum of physical and educational development; that a system of compulsory day continuation schools be developed and that attendance upon these be required of working children under eighteen years of age for a certain number of hours per week.

GEORGE HERBERT BETTS. *The Mind and Its Education.* Revised and Enlarged Edition. New York: D. Appleton and Company, 1916. Pp. xvi, 311.

It is a source of gratification to the author that this popular elementary treatise on psychology has had such a favorable reception. In the revised edition the topics of sensation and perception have received more extensive treatment, a new chapter on association has been added, and several chapters have been subdivided into numbered sections. The book keeps close to the traditional concepts of psychology and shows no influence of the recent activity in mental tests or of the trend toward behaviorism.

BROTHER CHRYSOSTOM. *Development of Personality. A Phase of the Philosophy of Education.* Philadelphia: John Joseph McVey, 1916. Pp. xxv, 379. $1.25.

As one might imagine, this is a plea for religious education, especially an education imbued with the ideals of the Catholic faith. It

is very interesting to see the biological psychology of Baldwin, the behaviorism of Watson, and the heredity theories of the eugenists calmly referred back to mediaeval philosophy. The author knows his modern biology and psychology. He is familiar with James, Titchener, Woodworth, Colvin, Dewey and even so recent a writer as Ellwood; and at the same time shows great skill in manipulating these arguments and using them to support his fundamental thesis, which is the need of mankind for training in the doctrines of the Roman Catholic Church.

TH. FLOURNOY. *The Philosophy of William James.* Authorized translation from the French by Edwin B. Holt and William James, Jr. New York: Henry Holt and Company, 1917. Pp. ix, 246. $1.30.

An interesting and sympathetic account of James' early life, his rejection of monism, and his attitude toward pragmatism, radical empiricism, pluralism, theism and the will to believe. James was primarily a psychologist and all of his philosophical theories were founded upon his psychology. In the opinion of the author he was probably the greatest psychologist that has ever lived, and we cannot hope soon to see his equal. The present book will undoubtedly gain a wider circle of friends for this psychological view of the universe.

HENRY FRANK. *Psychic Phenomena, Science and Immortality.* Second Edition. Boston: Sherman, French and Company, 1916. Pp. 556. $2.50.

The author of this book reveals an extensive familiarity with the trend of theory in modern physics and with the biology and psychology of a generation ago, and shows no little acumen in using these scientific data to support his view of the reality of spiritistic materialization. Such chapter headings as "The Seat of the Sub-conscious Mind," "Super-physical Senses," "Psychic Phenomena and Soul Substance," "Scientific Discovery of the Soul-body," "The Subtle Seat of Human Intelligence," and the like, point the way in which the author has gone, and are quite sufficient to the initiated to indicate the type of argument which one finds in the book. The scientifically minded individual can only regret this use of good knowledge in a bad cause.

WILLIAM SCOTT GRAY. *Studies of Elementary School Reading Through Standardized Tests.* Supplementary Educational Monographs, No. 1. Chicago: University of Chicago Press, 1917. Pp. viii, 157. $1.00.

This monograph gives us a detailed description and analysis of the tests of silent and oral reading used in the Cleveland Survey. There is a fairly extensive summary of previous investigations in reading, with a bibliography of forty-eight numbers; a description of the oral reading tests, with directions for use and standards for scoring; three specimens for use in silent reading tests, with questions

on each and directions for scoring; and a detailed discussion of the validity of both oral and silent reading tests on the basis of several thousand scores. A chapter is devoted to an extended account of the results of Cleveland Survey, and there is a final chapter on special problems in reading, including (1) periods of growth in reading achievement; (2) rates in oral and in silent reading; (3) relation of growth in oral reading ability to comprehension of subject matter read. The monograph is a valuable addition to the experimental literature on reading.

W. A. Jessup and L. D. Coffman. *The Supervision of Arithmetic.* New York: The Macmillan Company, 1916. Pp. 225. $1.10.

This is not a handbook for the teaching of arithmetic, but presents the results of some investigations of problems in the supervision of the subject. The authors discuss such topics as the subject matter of arithmetic and its distribution by grades, time allotment, dominance in methods of teaching, the sequence of the multiplication tables, oral work, drill, problems related to business life, and the results of special tests and investigations. The book is an excellent summary of recent thought on arithmetic in the schools, and will be a great help to superintendents and supervisors.

Paul Klapper. *The Teaching of Arithmetic. A Manual for Teachers.* New York: D. Appleton and Company, 1916. Pp. vii, 387. $1.45.

The author states in the preface that the aim of this book is to evolve a plan of teaching which is based on an approved psychology of number, which incorporates the lessons of contemporary research in methodology, and which has stood the final test of experience. In discussing the values of arithmetic the author frankly accepts the findings of experimental psychology and education as to the limited nature of the transfer of training, and therefore lays little emphasis upon the disciplinary value of the subject. Of the other values the cultural is largely a matter of tradition, the preparatory value applies chiefly to those who go on to higher work in mathematics, and the chief consideration left is its pleasure value. This, of course, has a profound effect upon the selection of subject matter in the course of study of arithmetic, and upon the methods employed in teaching the subject. If its chief value is satisfaction, then every effort should be made to raise this satisfaction to its highest point, and to eliminate as far as possible any disagreeable features that have characterized its presentation in the past. There are good diagrams comparing courses of study in arithmetic, a valuable discussion of general principles of teaching the subject, chapters on the organization of a recitation in arithmetic, devices for teaching the fundamental operations, common and decimal fractions, percentage and denominate numbers, graphs and the elements of statistics, and a final chapter on the Courtis Tests in Arithmetic. In an appendix the author also presents the Rice and the Stone tests.

NORBERT J. MELVILLE. *Standard Method of Testing Juvenile Mentality by the Binet-Simon Scale.* Philadelphia: J. B. Lippincott Company, 1917. Pp. xi, 140.

The author states in his preface, "Hitherto no Binet manual has appeared which embodies a uniform method of dealing with such questions as the following: With what tests should the examiner begin? Which of two alternative questions should be first employed in a given case? Under what conditions may a test be repeated? By what precise standards shall we decide whether responses in such tests as the definitions should be credited to age six or age nine?" This does not mean that the manuals of Goddard, Huey, Kuhlmann, Wallin and Terman are ignored, for the first thirty pages of the monograph are devoted chiefly to a critical discussion of the theory and practice of mental testing. The form of the scale used is the Binet revision of 1911. The chief characteristics of the author's "Uniform Method" are the grouping together of those tests which have proven most significant for the diagnosis of mental deficiency in one group, those which stand next in diagnostic value in a second group, and so on for six distinct groups of tests. Further those tests which involve similar material or methods are arranged in the same series so that they will be given in sequence. There are four pages of references to recent literature on Binet testing, samples of test record sheets, directions to examiners, and general rules for procedure. Part II contains the detailed directions for applying the individual tests, with notes indicating modifications found in various adaptations. These directions are conveniently thumb-indexed so that one can turn directly to the series of tests desired. Casual inspection leads one to think that the manual will be a very convenient guide for those who desire to use the original Binet 1911 revision.

J. C. MUERMAN. *Minimum School Term Regulations.* Bulletin, 1916, No. 42. Washington: Bureau of Education, 1916. Pp. 18. Five cents.

The general regulations regarding minimum school term are first reported by states and are again presented in compact tabular form.

JOSEPH C. PARK AND CHARLES L. HARLAN. *Some Facts Concerning Manual Arts and Home-making Subjects in One Hundred Fifty-six Cities.* Bulletin, 1916, No. 32. Washington: Bureau of Education, 1916. Pp. 25. Five cents.

The dominant aim is prevocational in character, and the attempt is made to give the pupil a broad idea of the use of tools, material and processes, rather than to develop a high degree of technical skill.

RUDOLF PINTNER AND DONALD G. PATERSON. *The Ability of Deaf and Hearing Children to Follow Printed Directions.* Reprinted from the Pedagogical Seminary, 23: 1916. 477–497.

The authors used the Woodworth and Wells easy directions tests and found that the average deaf child's ability is about equal to that of the average hearing child between the ages of six and eight.

Practice Teaching for Prospective Secondary Teachers. Educational Monographs, the Society of College Teachers of Education, No. 7. Cedar Rapids, Iowa: The Torch Press, 1916. Pp. 74. Twenty-five cents.

This monograph contains a report on the *Administrative Features of Practice Teaching for Secondary Teachers*, by A. R. Mead; *Inierrelations of Departments or Schools of Education with Academic Departments for Supervision of Practice Teaching and Special Method Courses*, by W. G. Chambers; *The Results of Practice Teaching for Secondary Teachers as Shown by Opinions of Superintendents*, by H. G. Childs; *Brief Descriptions of Organized Systems of Practice Teaching;* Recommendations of the Committee; and a bibliography of six pages.

JANET R. RANKIN. *Wisconsin's Overage Children.* Madison, Wis.: State Department of Education, 1916. Pp. 12.

Approximately fifty-three per cent. of the children of the Wisconsin schools were found to be overage. Remedies suggested for this condition are good instruction, good attendance, good discipline, summer or vacation schools, good supervision, flexible promotions, coöperation between the home and the school, and the revision of the course of study.

WILHELM HEINRICH RIEHL. *Burg Neideck.* Edited with notes by Garrett W. Thompson. Cincinnati: American Book Company, 1916. Pp. 224.

This is a very convenient and attractive edition of a story that is full of charm and interest for high school students.

EDWARD RUTLEDGE ROBBINS. *New Solid Geometry.* Cincinnati: American Book Company, 1916. Pp. xviii, 261–458.

As will be seen from the paging, this book is a continuation of the author's "New Plane Geometry." The figures are splendidly drawn and the book throughout shows the highest grade of workmanship.

State Higher Educational Institutions of Iowa. Bulletin 1916, No. 19. Washington: Bureau of Education, 1916. Pp. 223. Twenty-five cents.

This is the report of the survey of the work done in the three institutions for higher education in Iowa: The Iowa State University, The Iowa State College of Agriculture and Mechanic Arts and The Iowa State Teachers College. Recommendations are made to avoid duplication and to increase the efficiency of each institution.

CLIFF W. STONE. *Standardized Reasoning Tests in Arithmetic and How to Utilize Them.* New York: Teachers College, Columbia University, 1916. Pp. 24. Cloth, eighty cents; paper, fifty-five cents.

This is a reprint of the essential features of the author's "Arithmetical Abilities," the edition of which is now exhausted. The

author presents the original tests, directions for giving and scoring them, the graphic representation of the scores, and tentative standards.

GEORGE DRAYTON STRAYER AND NAOMI NORSWORTHY. *How to Teach.* New York: The Macmillan Company, 1917. Pp. vii, 297. $1.30.

"The art of teaching is based primarily upon the science of psychology. In this book the authors have sought to make clear the principles of psychology which are involved in teaching, and to show definitely their application in the work of the classroom." The titles of the chapters are The Work of the Teacher; Original Nature; Attention and Interest in Teaching; The Formation of Habits; How to Memorize; The Teacher's Use of the Imagination; How Thinking May be Stimulated; Appreciation; The Meaning of Play; The Significance of Individual Differences; The Development of Moral-Social Conduct; Transfer of Training; Types of Classroom Exercises; How to Study; and Measuring the Achievements of Children. In the discussion of formal discipline the position is taken that the amount of transfer depends chiefly upon the closeness of the bonds of identity between the two situations. The final chapter on measurement contains a discussion of the Woody Arithmetic Scales, the Thorndike Handwriting Scale, the Hillegas Composition Scale and the Trabue Language Scale. The book will be of very great value in introducing the young teacher to the results of recent scientific studies in education.

EDWARD K. STRONG, JR. *Effects of Hookworm Disease on the Mental and Physical Development of Children.* International Health Commission. Publication No. 3. New York: The Rockefeller Foundation, 1916. Pp. 121.

The problem of this investigation was to determine the difference among children not infected with hookworm, those infected and later cured, those infected and treated but not completely cured, and those infected but not treated. The children were measured and tested for height, weight, grip, lung capacity and tapping, and were also given the following mental tests: Opposites, Calculation, Logical Memory, Memory Span, Handwriting, Formboard and the Binet-Simon Tests. The author concludes that hookworm disease interferes decidedly with both physical and mental development. The longer the child has the disease the more he will lose mentally, and the less rapid will be his mental development after he has been treated.

GLEN LEVIN SWIGGETT. *Commercial Education.* Bulletin, 1916, No. 25. Washington: Bureau of Education, 1916. Pp. 96. Ten cents.

This is a report on the papers and addresses presented before the commercial sub-section of the second Pan-American scientific congress.

WINTHROP TALBOT. *Adult Illiteracy.* Bulletin, 1916, No. 35. Washington: Bureau of Education, 1916. Pp. 90. Fifteen cents.

Tables and graphs are presented to show the percentage of illiteracy in the various states by age groups, sex and nationality, and examples are cited to show the effort that is being made to combat and overcome illiteracy in this country.

LEWIS M. TERMAN AND H. E. KNOLLIN. *Some Problems Relating to the Detection of Borderline Cases of Mental Deficiency.* Reprinted from Journal of Psycho-Asthenics, 20, Nos. 1 and 2, September and December, 1915. Pp. 15.

The authors find that the earlier revisions of the Binet Scale are unfair to the dull-normal and borderline adults, causing these to test much too low. The result is an overestimation of the amount of feeble-mindedness among criminals, delinquents, etc. The more retarded the child is the stronger is the presumption that he is not as retarded as he ought to be. The judgment of the teacher upon the child's mental deficiency was found to be quite unreliable, while the results of the tests of intelligence were fully confirmed by subsequent school history.

AUGUSTUS O. THOMAS. *Rural Arithmetic.* Cincinnati: The American Book Company, 1916. Pp. 288.

This text is designed for classes in the upper elementary grades and in the high schools. Instead of the usual arithmetical rubrics we have such headings as tests for accuracy and speed; parcel post; land measurements; labor, machinery, and crops; feeding problems; farm records and accounts; light, fuel, and water; time and travel; building problems; general business problems; and miscellaneous applications.

University Training for Public Service. Bulletin, 1916, No. 30. Washington: Bureau of Education, 1916. Pp. 94. Fifteen cents.

This is a report of the 1915 meeting of the Association of Urban Universities, and contains papers on the need for coöperation, on methods of training for public service, and on results of coöperative training.

HOWARD C. WARREN. *Mental Association from Plato to Hume.* Reprinted from the Psychological Review, 23: 1916, No. 3. 208–230.

Part of a forthcoming volume on the history of associationism.

FREDERIC LYMAN WELLS. *Mental Regression: Its Conception and Types.* Reprinted from the Psychiatric Bulletin, October, 1916. Pp. 48.

Regression takes place when fundamental trends of the organism are replaced by trends less fundamental. As fundamental the author

considers the sexual-parental trends, the trends for obtaining food, those for protection against enemies, and the social trends. The article cites many instances of such regression, particularly in the sexual trend.

A. S. WHITNEY. *Education at the University of Michigan: History, Present Status, and Pressing Needs.* University of Michigan. June 1916. Pp. 20.

The most pressing needs are a training or laboratory school, and a broader organization as a college of education.

J. HAROLD WILLIAMS. *The Whittier Scale for Grading Home Conditions.* Whittier State School, Department of Research, Bulletin No. 3, 1916. Pp. 14.

The author presents a score card for the measurement of home conditions. The scale is arranged in six steps from 0 to 5 points on the topics: I. Necessities. II. Neatness. III. Size. IV. Parental Conditions. V. Parental Supervision. The scale is applied to grading fifty homes of non-delinquent children and one hundred twenty homes of delinquent boys at the state school.

J. HAROLD WILLIAMS. *Reorganizing a County System of Rural Schools.* Bulletin, 1916, No. 16. Washington: Bureau of Education, 1916. Pp. 50. Ten cents.

The survey includes first the geographical, economic, industrial and social conditions of the county, second, a survey of the present school system, the course of study and the teachers, and third, the discussion of a proposed educational reorganization.

LEON O. WISWELL. *How to Use Reference Books.* Cincinnati: The American Book Company, 1916. Pp. 162.

This includes training on how to use the library, on the use of the dictionary and the encyclopedia, reference books in particular subjects, and a discussion of library organization and equipment.

ERNEST C. WITHAM. *School Report of the Town of Southington, Connecticut.* 1916. P0. 55.

This report contains records of the standing of the pupils in the Courtis Arithmetic Tests and the Ayres Spelling Scale.

J. H. WORMAN. *New First Spanish Book.* Cincinnati: American Book Company, 1916. Pp. 127.

This introduction to Spanish is constructed on the natural or direct method and is designed for schools or self instruction. There are pictures of familiar objects, and questions and answers on these pictures.